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PHASE II PART A

TASK 1.2.7A

SYSTEMS INTERIM STATUS REPORTS

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METRO RAIL TRANSIT CONSULTANTS

June 29, 1989

Mr. James E. Crawley, P.E. Director of Transit Facilities Transit Systems Development Southern California Rapid Transit District 425 South Main Street Los Angeles, CA 90014

Subject: Metro Rail Project

Completion of Phase II, Part A

Purpose: Information Transmittal

File No: P001G082

Dear Mr. Crawley:

The Phase II Interim Status Reports enclosed with this letter comprise the deliverable work products required by the Phase II, Part A Scope of Services for the MRTC Systems Division. These deliverables fulfill the requirements of Tasks Number 1.F and 1.G of the District's Authorization To Proceed letter Number 88-06545, December 21, 1988.

Complete Statements of Tasks required and Tasks performed are contained in the enclosures representing work accomplished by our Train Control, Traction Power, Communications, Operations and Maintenance, and Safety Assurance and Security disciplines. There were no major equipment deliverables scheduled to be completed during the Part A, preliminary design period. Part A work was extended from April 28, 1989 to June 30, 1989 (by District direction) and the systems tasks were completed within the Part A systems budget.

Mr. James. E. Crawley June 29, 1989 Page 2

Work will be resumed on the Systems Division Tasks in accordance with the previously negotiated Scope of Services when District authorization is received.

Should additional copies of the submittals be required, we will be pleased to respond.

METRO RAIL TRANSIT CONSULTANTS

K.M. Murthy

Project Director

Encl: Phase II Interim Status Reports

Automatic Train Control (4)

Traction Power (4) Communications (4)

Operations and Maintenance (4) Safety/Assurance and Security (4)

Systemwide Equipment Procurement Study (4)

cc: W. Rhine, SCRTD

J. Sandberg, SCRTD

H. Storey, SCRTD

TSD-DCC DCC (2)

PHASE II INTERIM STATUS REPORT AUTOMATIC TRAIN CONTROL JUNE 30, 1989

This report summarizes work completed for Automatic Train Control System during the period ending with the cessation of work on June 30, 1989.

The following excerpts from the Phase II Work Program describe the Automatic Train Control work tasks assigned and the Work accomplished to an interim level during the period ending June 30, 1989:

- Establish power, grounding and equipment mounting space requirements on the wayside as well as in the ATC and Communications room and verify incorporation into MOS-2 facilities design planning.
- Refine and analyze block designs for combined MOS-1 and MOS-2 six car train operation at minimum headway taking into consideration operations in subway and on elevated guideway. Prepare analysis report utilizing ATC Block Design Computer Program.
- Refine design requirements for MOS-2 interlocking, including diamond cross-overs, pocket tracks, turnouts and turn back at terminal stations based on selected MOS-2 configuration. Incorporate requirements in prelimi-nary specifications.

The work program, which began in January 1989, called for work products to be developed on the following schedule:

| Production | Completion Scheduled |
|----------------------------|----------------------|
| Alignment & Operating | |
| Parameters | March 17, 1989 |
| Interim Status Report | April 28, 1989 |
| Draft Report (Part B Task) | July 28, 1989 |
| Final Report (Part B Task) | Sept. 29, 1989 |

Initially the cessation of Phase II design work was scheduled to occur on April 28, 1989, so that the product at that interim period would have been the Interim Status Report. Phase II Part A work was rescheduled from April 28 to June 30 by RTD concurrence and direction.

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Summary of Work Completed.

- 1. Work originated by Systems.
 - Worked with the Civil Engineers and Operations/ Maintenance Planners in the preparation of an interim status report on Phase II alignment and operating parameters. (Copy Attached)
 - Provided support in the preparation of the systemwide equipment procurement study.
 - Prepared approximate equipment lists, quantities, and space requirements in providing support for preparation of the Phase II cost estimates.
- 2. Review of design products originated by others.

Reviewed preliminary facilities designs (MacArthur Park interlocking, Wilshire/Vermont, Vermont/Beverly, Vermont/Sunset, Hollywood/Vine, and B330) to Verify, to the extent practicable, that existing standards and requirements for ATC are being incorporated; also the reviews provided some insight for defining the issues that must be addressed as the Phase II work progresses. The ensuing activities and definitions from the reviews are as follows:

- Verified that the MOS-1 criteria regarding ATC equipment space, power, and conduit provisioning requirements are applicable to Phase II.
- Identified the criteria for locating and sizing additional train control rooms (other than at stations) to accommodate the full-pocket and long station-to-station interlockings distances; investigated the restraints and other for determining and optimizing factors locations.
- Identified possible impacts to block design resulting from characteristics of the preliminary alignment; the effects of curves and grades on operations, headway, and run time must be closely monitored when Phase II design resumes.
- Identified signaling alternatives for the Phase II interlockings; alternatives regarding automatic terminal operation, pocket routing, operations, call-on, train storing, back-up routing, converge/diverge operations, stopping, location of block boundaries, and signal approaches must all be addressed when Phase II ATC design begins.

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Determined which stations may be approached as "typical" with regard to ATC requirements in facilities design.

ANALYSIS OF PHASE II ALIGNMENT & OPERATING PARAMETERS INTERIM STATUS REPORT JUNE 30, 1989

SUMMARY

This report describes work accomplished in response to the Metro Rail, Phase II, Part A task entitled Automatic Train Control Block Design Analysis. The description includes a brief report on the status of design work, as of the cessation of work on Phase II work tasks, on June 30, 1989, and comments on remaining work to be done after Phase II design resumes. The ATC Block Design Analysis is a necessary task in preparation for Phase II block design to be accomplished, and thus is a necessary step in the preparation of ATC furnish and install contract documents.

The work program description of the ATC Block Design Analysis task is:

Refine and analyze block designs for combined MOS-1 and MOS-2 six car train operation at minimum headway taking into consideration operations in subway and on elevated guideway. Prepare analysis report utilizing ATC Block Design Computer Program.

The work program calls for four products:

- 1. Alignment & Operating Parameters
- 2. Interim Status Report
- Draft Report (Part B Task)
- Final Report (Part B Task)

Product 1 consisted of working notes used in the preparation of this report. Work on product 3, the draft report, will begin when Phase II design resumes.

This report is formatted with respect to geographical portions of the route, starting at the MOS-1 boundary at Alvarado Street.

MACARTHUR PARK POCKET TRACK

1. The addition of a full-pocket interlocking at this location imposes the requirement for an additional train control room. Several decisions must be made concerning options for emergency operation from a local control panel, maintainer needs, and SCADA interface. For preliminary design the control rooms will be treated as two separate locations.

- 2. Preliminary operating and block design criteria require trains to operate at 45 mph between Wilshire/Alvarado and Wilshire/Vermont, A5 and A6. Except for turnout moves, civil speed restrictions in this area should not be less than 45 mph.
- 3. Criteria concerning control and operation of the pocket interlocking must be established. The options of automatic routing, pushbutton back-up routing, call-on routing, and SCADA automatic routing will be considered. Alternatives will be analyzed and selected to fit SCRTD needs as appropriate during the design phase.
- 4. Distance to the A6 TC&C room is approximately 5,100 ft., which is within design limits.
- 5. Normal train speed from A5 to A6 will be 45 mph due to curves starting at approximately 292 and 303.
- 6. Trains traveling from A6 to A5 will be restricted to 45 mph for the early part of the trip; however, once the rear of the train clears the curve at (approximately) 292, it can be commanded to accelerate to 55 mph. The 55 mph command will be given, if the R=2500 curve (at approximately 278) can be designed with at least one inch of superelevation (to allow a 55 mph curve rating) without interfering with the special trackwork.
- 7. Block design specifications will be supplemented to address system characteristics introduced to Metro Rail in the MOS-2 alignment. In order to optimize operation with a full-pocket interlocking, requirements addressing the approaches to the wayside signals should be added. The signals that control both normal traffic movements, and diverging moves into the pocket track, should have an associated approach block of length consistent with a train approaching with a 9 mph speed command.
- 8. Where a station platform track constitutes all or part of the approach distance to a wayside signal, train moves into the station with the signal at STOP may have to be made in Restricted Manual Mode; manual berthing must be performed if the ATP subsystem does not permit the train to completely berth while operating in the ATO programmed station stopping profile. If manual berthing is required, preferred operation is to stop the train outside the platform, and then proceed to complete berth in manual mode. At A5 both station platforms are bounded by wayside signals; each scenario must be investigated to determine where manual berthing should be implemented.

9. Specific directive drawing(s) or marked up civil drawings will be needed for locating conduits and wayside equipment.

WILSHIRE/VERMONT (A6)

- 1. This is a diverge/converge interlocking. It is the only one in the Metro Rail System to date. Specific directive drawing(s) or marked-up civil drawings will be needed for locating conduits and wayside equipment.
- 2. Due to curves, maximum train speed between A6 and Wilshire/Normandie (B1) will be 45 mph for both tracks in both directions. Maximum speed for trains traveling from A7 to A6 will be 45 mph due to curve. Trains traveling from A6 to A7 could be given a 55 mph command when the rear of the train vacates the curve at 341; however, given that the distance required to accelerate from 45 mph to 55 mph is entirely 3.75% upgrade, it may be of questionable benefit in shortening runtime.
- 3. Design headway beyond the diverge/converge points will be 120 seconds per SCRTD acceptance of this feature as a cost reduction in the budget estimate. This applies to the normal direction station-to-station runs from A7 to A6 and B1 to A6 for following trains in the same traffic pattern.
- 4. Operation of the AL track interlocking (normally-converging) should have approach cleared automatic routing. The automatic routes will be cleared on a first-come, first-reguested basis, and alternating routing if both approach zones are occupied.

The block design specifications should require that a block boundary be located the distance in approach to each wayside signal corresponding to a 9 mph SBD, and that additional blocks shall be provided as necessary to attain the optimum intermediate speed approach to a signal at STOP.

- 5. Operation of the AR track interlocking (normally diverging) should not have automatic routing. RCC is provided train destinations, and can route automatically or manually. To continue operations in the event of RCC or CTS failure, a wayside pushbutton for routing should be provided. It may not be advantageous to require the train to close within 9 mph SBD of the red signal, since this would leave the train only partially within the platform. Options for operation are:
 - a. Locate block boundaries and transmit speed commands such that trains will stop outside of the station platform. If the delay in waiting for the signal to

clear is significant, RCC can authorize stop-andproceed movement into the station.

- b. The platform definition track circuit can be used as a zero speed block. This will allow the train in ATO to stop part-way in the station, and then berth manually in stop-and-proceed submode of MTO.
- 6. The approximate distances to adjacent TC&C rooms is 4,700 ft. to B1, and 5,700 ft. to A7; this is satisfactory.

WILSHRIE/NORMANDIE (B1)

- 1. Train speeds between this station and Wilshire/Western (B2) will not exceed 45 mph due to short distance.
- 2. The distance to the B2 TC&C room is approximately 2,200 ft. This short distance could allow deletion of this train control location. The distance is short enough that ATC would not require an equipment room; however, minimal cost savings would be realized since an equipment room for communications and ATC interface equipment (PSS and door control equipment) would be needed. Also, maintenance becomes easier as the distance between the ATC room equipment the wayside equipment becomes less.
- 3. Bl is a typical non-interlocking station; a common directive drawing for all non-interlocking stations is sufficient to illustrate ATC conduit and cableway needs.

WILSHIRE/WESTERN (B2)

- 1. This will be a temporary terminal location with diamond interlocking. Operation and design principles will be very similar to those of Wilshire/Alvarado for MoS-1. If a tail track can be included behind the station, runtime can be improved 25 seconds or more.
- 2. If the above-referenced tail track cannot be incorporated, then the use of trip stops, similar to A5 MOS-l configuration, can permit the transmission of adequate speed commands on approach and into the platform for ATO operation, without requiring a long overrun track behind the platform.
- 3. A directive drawing should be developed to define the conduit requirements for this diamond interlocking; it may serve as a general directive for other diamond interlockings.
- 4. For BR Track block design specifications should require an approach block corresponding to 9 mph SBD, and best intermediate speed command approach to a signal at STOP.

VERMONT/BEVERLY (A7)

- 1. This diamond Interlocking is typical with no automatic routing.
- 2. Maximum train speed on both tracks and in both directions between A7 and A8 will be 55 mph.
- Distance to the A8 TC&C room is approximately 4,700 ft., which is easily within limits.
- 4. A typical directive drawing for diamond interlocking locations should be sufficient to show conduit requirements.
- 5. Block design rules for approach to a signal at STOP through the platform track should be consistent with A5.
- 6. For AR track block design rules should allow 9 mph SBD approach to signal at STOP from the A6 direction.

VERMONT/SANTA MONICA (A8)

- 1. This is a typical non-interlocking station. Typical directive drawing will be sufficient to convey ATC conduit requirements.
- 2. Distance to A9 TC&C room is approximately 2,800 ft., which is substantially within limits; this indicates that only about 6 track circuits total will be required at this TC&C room location.
- 3. Maximum train speed on both tracks and in both directions between A8 and A9 will probably be 45 mph. Acceleration above the 45 mph speed regulation point would be possible; however, only a very minimal runtime savings on the A8 to A9 route would be achieved, since accelerating on a 4% upgrade would limit the time at higher velocity. Increased braking distance and slowing to 45 mph for a station stop would limit the speed in the A9 to A8 direction.

VERMONT/SUNSET (A9)

- This is a typical diamond interlocking. A typical directive drawing developed for A7 should suffice for defining conduit needs.
- 2. The distance to the AlO TC&C room is approximately 5,800 ft.; this presents no problem.
- 3. Maximum train speed from station AlO to A9 will be restricted to 55 mph because of curve.

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4. Maximum train speed from A9 towards A10 could be accelerated beyond 55 mph after curve, although runtime savings would be minimal.

HOLLYWOOD/WESTERN (A10) -

- 1. This is a typical non-interlocking station. A typical directive drawing for conduit should suffice.
- 2. Distance to All station is about 5,100 ft. which is easily within the limits.
- 3. Maximum train speed from All to AlO would be 55 mph. There are no curve restrictions to limit to this speed; however, this is due to the short distance, and because part of the acceleration distance is on a 2% upgrade.
- 4. Maximum train speed from AlO to All could be above 55 mph; acceleration is assisted by 2% downgrade in the area where the limit is 45 mph or above. Actual runtime savings would be a nominal 4 seconds (very approximate).

HOLLYWOOD/VINE (All)

- 1. This is a pocket track interlocking location and will need a specific directive drawing to show the conduit and cableway requirements.
- 2. Distance to Al2 TC&C room is approximately 4,200 ft.
- Operation of the pocket track should be consistent with Wilshire/Alvarado pocket, unless specific requirements of the SCRTD warrant deviation.
- 4. Maximum train speed on both tracks and in both directions between All and station Al2 will be 55 mph.

HOLLYWOOD/HIGHLAND (A12)

- 1. This is a typical non-interlocking station. A typical directive drawing for conduit requirements will be sufficient.
- 2. Long distance to Al3 station (approximately 16,800 ft.) will require TC&C rooms at the vent shafts at 653 and 709. Cable lengths would be excessive without the additional rooms.
- 3. Curve at west end of Al2, and before the crossover at Universal City (Al3), will limit speed slightly for trains

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in both directions. However, much of the distance can be traveled at 67 mph.

UNIVERSAL CITY (A13)

- 1. This is a diamond interlocking, temporary terminal station. A typical directive drawing developed for other diamond interlocking locations should be sufficient for defining the conduit needs.
- 2. This location could be a temporary terminal for long duration. If so, 320 ft. minimum of tail track should be provided behind the station. This would be sufficient to store a 4 car train. And also, would make a significant runtime differential of 25 seconds or more for each train.
- 3. Block design specifications should require train to approach signal at STOP to within 9 mph SBD in normal direction.

PHASE II INTERIM STATUS REPORT TRACTION POWER JUNE 30, 1989

Introduction

This report summarizes Phase II traction power design work accomplished during the work program period ending June 30, 1989 and describes the interim status of the products of that work at the time of the end of the work program.

Scope of Work

The following traction power design activities were assigned under task 1.2.7.A of the Contract Scope:

- 1. Special studies were planned in two main areas of traction power design:
 - a. Emergency Backup Power Analysis Establish the emergency backup power requirements for the Phase II alignment taking into account critical load demands for systems and facilities equipment.

This study is needed to determine a feasible and cost effective means of powering methane gas ventilation fans in the event of failure of the primary and alternative power supplies from the power utility. Five milestones were planned:

- (1) Phase II Power Requirements
- (2) Examine DWP Alternatives
- (3) Interim Status Report
- (4) Draft Report (Part B Task)
- (5) Final Report (Part B Task)
- b. Traction Power Transit Operating Model Analysis Perform computer simulation runs (TOM runs) to establish power requirements and refine substation locations and capacity ratings for Phase II alignment.

The purpose of the analysis is to identify the potential number, location, and power capacities of traction power substations for the selected candidate route alignment and profile of Phase II. Four milestones were planned:

- (1) Alignment & Operating Parameters
- (2) Part A Interim Status Report
- (3) Draft Report (Part B Task)
- (4) Final Report (Part B Task)
- 2. Systems engineering Traction Power support activities were assigned in three areas:

- a. High voltage supply and distribution -- Prepare preliminary design for distribution of D.C. power and installation of 34.5 KV feeders for tunnels and stations.
- b. Support of designs for traction power substations and electric power utility service facilities -- Define electric substation and utility entrance minimum sizes and coordinate incorporation of equipment room requirements into facility design planning.
- c. Support of designs for electric power for passenger station and tunnel facilities including emergency ventilation equipment -- Review facility electric power loads for stations and vent shafts to establish required ratings of auxiliary power transformers.

Work Accomplished and Work Products

1. Special Studies:

The design of the emergency backup power supply (EBPS) system for Phase II was advanced to the "Examine DWP Alternatives" stage, but the milestone was. It is recognized however, that power completed. requirements for facilities essential to prolonged operation, in case of an event that would cause loss of primary and secondary utility power, can be directly extrapolated from the MOS-1 EBPS requirements, since both route portions are in subway, and there are no long interstation tunnel segments until the alignment north of the Hollywood Boulevard corridor needs to be considered. (Issues related to both normal and emergency power supply are yet to be addressed with regard to the tunnels through the mountains.) -

Regarding EBPS design for the Wilshire and Vermont corridors, we will need to assess, more accurately than we have to date, the distance beyond which 34.5 KV voltage drop from the feed point in the MOS-1 yard becomes excessive. When Phase II design resumes, we will need to address designs considerations similar to those we addressed, with the District engineering staff, for the conceptual design of the MOS-1 EBPS.

b. A transit operation model (TOM) analysis of traction power requirements was carried out for the Phase II alignment identified as candidate alignment No. 1 modified (CAIM) based on extrapolation from results of a TOM analysis of the original starter line.

The analysis indicated that the rectifier rating selected as the standard size for MOS-1 traction power substation (TPSS) is suitable for Phase II, and that by the

"design year" (2000), double rectifier/transformer units will be needed at each Phase II TPSS.

Because the extrapolation method yields conservative results, a more exacting analysis will be performed when Phase II design work resumes, to see if single rectifier/transformers can adequately serve some TPSS locations for a significant initial operating time. A copy of the revised report is attached.

2. Support Activities:

- a. TPSS equipment room space, access and conduit requirements were given to facilities designers.
- b. High voltage supply and distribution designs were advanced to a preliminary level that enabled us to provide to passenger station designers requirements for electric power incoming service facilities, conduits, blockouts, and equipment entrance ways.
- c. Space requirements were coordinated with the facilities design group for the incoming service (DWP) and traction power substation rooms at Wilshire/Vermont, Vermont/Beverly, Vermont/Santa Monica, Hollywood/Highland, and Universal City passenger stations. Preliminary equipment layouts were performed for these rooms to confirm that the planned room configurations and allocated spaces are adequate.
- d. Facilities drawings for construction contracts B331 and B201 were marked up to identify traction power requirements including traction power conduits and other embedments as well as interfaces at panelboards, junction boxes, etc.
- e. Preliminary contact rail designs were performed for Wilshire/Vermont "Y" and MacArthur Park pocket track structure to coordinate conduit stubups and walkway locations.
- f. Design support service inputs were provided for cost estimating, scheduling, and equipment descriptions as required for development of budgets, project schedules, and contract unit descriptions.
- g. Facilities design packages were reviewed and commented on, and responses to the comments were coordinated.
- h. Support was provided for the systemwide equipment procurement study.

METRO RAIL PROJECT MOS-2, LPE

TRACTION POWER SUBSTATIONS LOCATIONS AND EQUIPMENT SIZES REPORT FOR CA1M

Prepared for Southern California Rapid Transit District

by

Metro Rail Transit Consultants

February 1989

The preparation of this document has been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended, the State of California, and the Los Angeles County Transportation Commission.

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I. EXECUTIVE SUMMARY

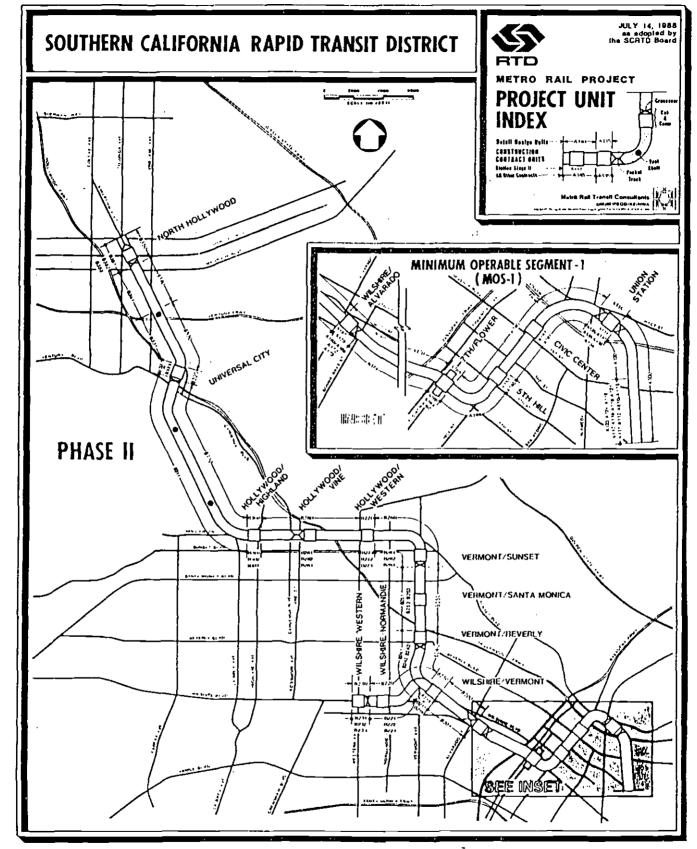
This report identifies the potential number and locations of traction power substations for the selected Candidate Alignment No. 1 Modified (CA1M) as shown on Figure 1. The report also evaluates the equipment sizes (ratings) necessary to meet the Design Year and Long-Range Design Standard (LRDS) operating requirements for the combined MOS-1 and MOS-2 segments as defined by DD-002¹.

The methodology used to determine the spacing, locations, and rating of substations for CAIM consists of the following analytical procedures:

- The minimum acceptable voltage at trains to provide the necessary performance for the required peak period service headway establishes the average distance between, and optimum location of, the substations.
- o Train size and service headway during peak period operation establishes the maximum load for which the traction power system should be designed.
- o The maximum load on each substation is established from the first and second procedures.
- o The required equipment continuous rating at each substation is derived from the load established by the third procedure.

These procedures have established preliminary locations and equipment ratings for CAIM which are shown in Table 1. These findings are to be confirmed by a detailed system analysis during preliminary engineering and final design phases of the project.

Design Directive, Accommodation of Patronage Growth, Metro Rail Project, Long-Range Design Standard.



CANDIDATE ALIGNMENT NO. 1 MODIFIED (CA1M)

Figure 1

TABLE 1

CAIM

Substation Locations and Power Rectifier Ratings

| Substation | Rectifier Rating | (kW) |
|--------------------|------------------|---------|
| Locations | Design Year* | LRDS** |
| | | |
| Wilshire/Vermont | 2 X 2,500 2 | X 2,500 |
| Wilshire/Western | 2 X 2,500 2 | x 2,500 |
| Vermont/Beverly | 2 X 2,500 2 | x 2,500 |
| Vermont/Sunset | 2 X 2,500 2 | x 2,500 |
| Hollywood/Western | 2 X 2,500 2 | x 2,500 |
| Hollywood/Vine | 2 X 2,500 2 | x 2,500 |
| Hollywood/Highland | 2 X 2,500 2 | x 2,500 |
| Vent Shaft | 2 X 2,500 2 | x 2,500 |
| Universal City | 2 X 2,500 2 | x 2,500 |
| North Hollywood | 2 X 2,500 2 | x 2,500 |

- * Six-car trains at 6-minute headway over branches and 3-minute headway over common alignment
- ** Six-car trains at 3-minute headway over branches and 2-minute headway over common alignment

II. BACKGROUND

This report provides the results of the study performed under Limited Preliminary Engineering for the selected Locally Preferred Alignment (LPA), identified as CAIM. The study covers a preliminary evaluation of traction power substation locations for this alignment, the load on each substation, and the proposed dc equipment ratings. The evaluation covers the requirements for train service over the combined MOS-l and LPA segments, for the Design Year, and Long-Range Design Standard (LRDS) as defined by Design Directive DD-002.

III. CRITERIA AND METHODOLOGY

The determination of substation locations and capacities is based on the Metro Rail Project System Criteria for traction power and on the methodology used in a previous study performed for the original starter line between Union and North Hollywood stations. The evaluation of substation spacing for each candidate alignment is based on the established vehicle performance characteristics, corrosion control requirements, and existing traction power wayside distribution parameters.

The evaluation of the traction power system total capacity and individual substation ratings is based on extrapolation from the results of a study performed by transit operation model (TOM) analysis of the original starter line.

The evaluation of substation equipment sizing (rectifier and dc switchgear ratings) is based on the maximum load demand during peak period service operation and recognized standard ratings for this class of equipment.

IV. CAIM PARAMETERS

The alignment used for the study is shown diagramatically on Figure 2 and identified as CALM. It extends from Wilshire/Alvarado Station to the LPA terminal stations identified as Wilshire/Western and North Hollywood.

The operating parameters used in performing the study are based on those given in the SEIS/SEIR ² and DD-002, and are described as follows:

Report WBSZ-72-G12, Traction Power System Study, July 1985.

Draft Supplemental Environmental Impact Statement/ Subsequent Environmental Impact Report, Los Angeles Rail Rapid Transit Project, Metro Rail, November 1987.

- o The traction power system design is based on the maximum number of cars per train and shortest headway to be used during peak period service.
- o At the Design Year, six-car trains will operate at a headway of 6-minutes over the two branches and at a headway of 3-minutes over the common alignment between Wilshire/Vermont and Union stations.
- o For the LRDS, six-car trains will operate at a headway of 3-minutes over the two branches, and at a headway of 2-minutes over the common alignment.

V. TRACTION POWER SUBSTATION LOCATIONS

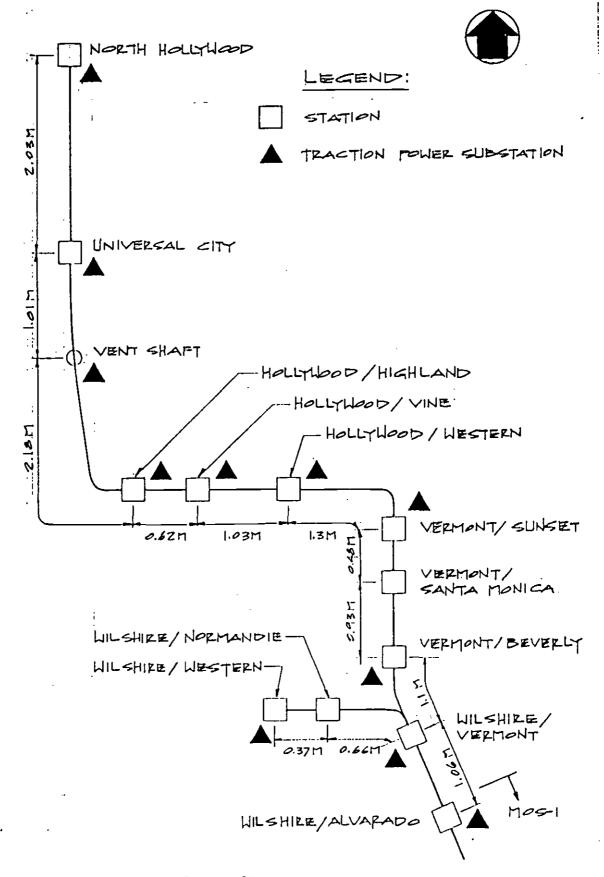
Previous traction power and corrosion control studies performed for the Metro Rail Project have confirmed that for a 750-V dc traction power system, substations should be located at stations, and with an average spacing between substations of one mile. These factors ensure that an average voltage of not less than 650 V is maintained at the vehicle power pick-up shoes during peak period service with all substations in operation. The proposed locations and estimated distances between traction power substations for CAIM are shown on Figure 2.

VI. TRACTION POWER SYSTEM LOAD

The evaluation of load on the LPA segment traction power system is based on peak period service requirements, the stated criteria and methodology, and extrapolation of the data obtained from the previous study for the original starter line. Load calculations are attached as Appendix A.

A. Peak Period Service Load

The previous studyl performed on the original starter line established the traction power load during peak period service. A TOM program simulation was made for six-car trains operating at 2-1/2-minute headways over a distance of 17.87 miles between the Union and North Hollywood terminal stations. The peak period load on the traction power system was established as being in the order of 72,000 kW. This data is derived from Table 3-3A of that study, which is included in Appendix B. The original traction power system incorporated 16 substations, spaced apart at distances varying between 0.6085 and 2.4256 miles.



LPA CAlM
TRACTION POWER SUBSTATION LOCATIONS

Figure 2

The average load demand on each substation varied between 3,700 kW and 5,200 kW, with an average value of 4600 kW. The average load demand per mile of alignment was:

$$\frac{72,000}{17.87} = \frac{4063 \text{ kW}}{}$$

B. LPA Segment Peak Period Service Load

The preliminary evaluation of peak period service load on the LPA segment traction power system can be extrapolated from the data derived from the previous system study! by the following methodology:

- o The calculation of average load demand is based on the formulae used for the previous system study to convert the output data from the TOM computer simulation program 7. These formulae are given in Appendix C.
- peak period LRDS load demand per mile on 0 the original starter line traction power six-car trains system, with operating 2-1/2-minute intervals, can be converted to an "equivalent value" average load per mile alignment for a single car by means of the referenced formulae. This value of load for establishing used as the basis the load system on the traction power for the LPA segment.
- The CA1M alignment between Wilshire/Alvarado 0 the Wilshire/Western and North Hollywood and stations comprises approximately 12.82 double-track mainline, with 11 passenger stations and 10 traction power substations. The traction power system capacity is based on peak period service over the two branches.

C. Design Year Service Load

- o At the Design Year, peak period service will be performed by six-car trains operating at headways of 3-minutes over the trunk line and 6-minutes over the two branch lines.
- o The traction power system load was calculated from the "equivalent value" and established as 7,184 kW for the trunk line and 28,615 kW for the two branch lines.

The average substation load demands are 3,036 kW for trunk substations and 3,179 kW for branch substations.

D. LRDS Service Loads

- The LRDS peak period service will be performed by six-car trains operating at headways of 2-minutes over the two branch lines.
- o The traction power system loads calculated from the "equivalent value" were 8,798 kW for the trunk line and 40,474 kW for the two branch lines.
- The average substation load demands are $\frac{4,399 \text{ kW}}{4,497 \text{ kW}}$ for branch substations.

VII. LPA SEGMENT TRACTION POWER SUBSTATION EQUIPMENT CAPACITY

The major items of substation equipment, whose capacity is dependent on the load for peak period train operation, are the transformer/rectifier units and do switchgear. Based on established criterial for traction power system design, all substations shall have provision for two transformer/rectifer units of equal capacity to meet the full system LRDS service load demand and provide partial redundancy.

Each transformer/rectifier unit will have a two-hour overload capability of 163 percent of its continuous rating. This overload capability can be used to meet the peak period service load and abnormal loading conditions caused by a substation outage. This overload capability is not normally used, however, for the evaluation of transformer/rectifier rating for peak period load under normal operating conditions because of the reduction of dc voltage level at the substation bus.

The dc switchgear ratings are based on the overload capability of the selected transformer/rectifier units and on the load imposed by trains operating on each segment of railtrack supplied from the substation.

A. Rectifier Transformer Capacity

o Based on the average load per mile of track, two 2,500 kW transformer rectifier units will have to be installed at all trunk and branch line substations in order to satisfy the peak period service for the Design Year.

o The two 2,500 kW transformer rectifier units will also support the LRDS peak period service.

B. 750-V Dc Switchgear Rating

- o The switchgear bus and transformer/rectifier unit cathode circuit breaker continuous current rating will match the rectifier two-hour overload rating as follows:
 - 2,500 kW transformer/rectifier unit 2-hour overload rating = 2,500 x 1.63 = 4,075 kW

Therefore: Main bus and cathode circuit breaker rating will be not less than: $\frac{4075 \times 10^{3}}{750} = \frac{5433 \text{ A}}{2}$

o Feeder circuit breaker current rating will be based on the LRDS service load, with 6-car trains operating at 2-minute headways. From the previous sytem study performed for LRDS service, it was established that the required continuous current rating of the 750V dc feeder circuit breakers was 4,000 A.

END OF REPORT

APPENDIX A



METRO RAIL TRANSIT CONSULTANTS

| LOS ANGELES METRO RAIL PROJECT | 108 No. MOS-2 LPE | SHEET NO. 1 OF 3 |
|------------------------------------|-------------------|------------------|
| | DESIGNED BY GWP | DATE 8/21/88 |
| TRACTION POWER SYSTEM CALCULATIONS | APPROVED | |

CALCULATION OF AVERAGE KW LOAD PER TRAIN

A. BAZIS FOR CALCULATION:

- AVERAGE LOAD PERTRAIN (KW)

KHERE

N = NUMBER OF CARS PER TRAIN

HOWY = HEALWAY IN SECONDS

V = DC VOLTAGE AT SUBSTATION BUS

A = AVE. (ASQ-H)

B = MIN. (ASQ-H)

C = MAx. (ASQ-H)

O. PEAK LOAD ON ORIGINAL STARTER LINE FOR LRDS SERVICE (REF. TABLE 3-3A OF JULY 1925 REPORT)

TOTAL LOAD ON TRACTION POWER SYSTEM (COLUMN 3) = 72600 kW

LENGTH OF STRETCE LINE ROUTE N 17.87 MILES

AVERAGE LOAD / MILE OF ROUTE = 72600 = 4063 kW

O EQUIVALENT LCAD OF ONE CAR/MILE OF ROUTE (KWC)
FROM G CAR TRAINS AT 2-12 MINUTE FEADWAYS

:
$$kW_C = 4063/6 \times \sqrt{\frac{3600}{150}} = \frac{4063}{6 \times 4.9} = 138kW$$

| Page 2 of 3 | |
|------------------------|--|
| Made by DAN BALCEIANIU | |
| Date 2/10/89 | |
| Checked by | |
| Date | |

B. PEAK LOAD/MILE ON LPA TRACTION POWER SYSTEM.
B1. DESIGN YEAR

o TRUNK LINE - 6 CAR TRAINS AT 3min HEADWAYS $LD/M = 6 \times \sqrt{\frac{3600}{180}} \times 138^{\frac{4}{3}} = 3703 \text{ kW/mile}$

O BRANCH LINES - 6 CAR TRAINS AT 6 MIN HEADWAYS

$$LD/M = 6 \times \sqrt{\frac{3600}{360}} \times 138 = \frac{2618}{2618} \times W/mile$$

12. LRDS

• TRUNK LINE - G CAR TRAINS AT 2 MN HEADWAYS $LD/M = 6 \times \sqrt{\frac{3600}{120}} \times 128 = 4535 \text{ kW/MILE}$

O BRANCH LINES - 6 CAR TRAINS AT 3 MIN HEADWAYS $LD/M = 6 \times \sqrt{\frac{3600}{180'}} \times 138 = \frac{3703}{180'} \times \frac{100}{180'}$

C. WERAGE LOAD ON LPA TRACTION POWER SUBSTATIONS

(CAIM ROUTE LENGTH IS 12.87 MILES OUT OF

WHICH 1.94 MILES ARE FED BY TWO "TRUNK" SUBSTATIONS

AND 10.93 ARE FED BY 9 BRANCH" SUBSTATIONS)

C1. DESIGN YEAR

. O TRUNK LINE - G CAR TRAINS AT 3 MIN HEADWAYS

* EQUILALENT LOAD /CAR KWC = 139 KW

| Page <u>3</u> of <u>3</u> |
|---------------------------|
| Made by Mai Carcoratur |
| Date 2/10/89 |
| Checked by |
| Date |

• BRANCH LINES - GCAR TRAINS AT 6 MIN HEADWAYS

LD/S = 2618 x 10.93/9 = 3179 kW

CQ. LRDS

- TRUNK LINES G CAR TRAINS AT 2 MIN HEADWAYS

 LD/S = $4535 \times 1.94 / 2 = 4399 \text{ k/c}^2$
- o BRANCH LINES 6 CAR TRAINS AT 3 MIN HEADWAYS $LD/S = 3703 \times 10.93/9 = 4497 \, kW$

APPENDIX B

TABLE 3-3A

COMPLETE STARTER LINE CONFIGURATION (2-1/2-MIN HEADWAY) NORMAL OPERATING CONDITION SUBSTATION AVERAGE LOAD AND TRAIN VOLTAGE

| | | | | * | |
|--------------------|---------|---------------------|-----------------|---|----------------|
| Substation | Spacing | Rectifier Rating | Average Load | Required Minimum Capacity (MW) | |
| <u>Location</u> | (Miles) | <u>(MW)</u> | Demand (MW) | (PW) | <u>Voltage</u> |
| Union | 0.8356 | 2 x 2.5 | 3.1 | 2.1 | 693 |
| Civic Center | 0.4595 | 2 x 2.5 | 4.7 | 3.1 | 711 |
| Sth/Hill | 0.5473 | 0 | 0 | 0 | 669 |
| 7th/Flower | 1.1178 | 2 x 2.5 | 5.0 | 3.3 | 699 |
| Wilshire/Alvarado | | 2 x 2.5 | 4.7 | 3.1 | 694 |
| Wilshire/Vermont | 1.0412 | 2 x 2.5 | 5.1 | 3.4 | |
| Wilshire/Normandie | 0.5981 | 0 . | 0 | · 0 | 706 |
| Wilshire/Western | 0.4245 | 2 x 2.5 | 5.1 | 3.4 | 669 |
| Wilshire/Crenshaw | 0.6085 | 2 x 2.5 | 4.6 | 3.1 | 710 |
| Wilshire/La Brea | 1.4161 | 2 x 2.5 | 4.7 | 3.1 | 700 |
| Wilshire/Fairfax | 0.9463 | 2 x 2.5 | 4.2 | 2.8 | 692 |
| Fairfax/Beverly | 0.8341 | 2 x 2.5 | 4.4 | 2.9 | 708 |
| Fairfax/S. Monica | 1.0654 | 2 x 2.5 | 4.7 | 3.1 | 703 |
| La Brea/Sunset | 1.3445 | 2 x 2.5 | 4.8 | 3.2 | 690 |
| Hollywood/Cahuenga | 0.9922 | -2 x 2.5 | 5.2 | 3.5 | 693 |
| Vent Shaft: | 2.4356 | 2 x 2.5 | 4.1 | 2.7 | 648 |
| Sta. 876+63 | 1.0125 | | | | 689 |
| Universal City | 2.1885 | 2 x 2.5 | 4.5 | 3.0 | 676 |
| North Hollywood | | 2 x 2.5 | 3.7 | 2.5 | . • |
| | | | | | |

^{*} Average load demand divided by rectifier 2-hr overload capability of 150% rating.

^{**} Minimum voltage at a train operating between adjacent stations.

APPENDIX C

FORMULAE FOR

SUBSTATION POWER CAPACITY CALCULATIONS

1. Average PMS Current

A. Average PMS I = {Amperes/Vehicle}

$$\sqrt{\text{(Avg. (ASQ-H)} \times \frac{(3600)}{\text{HDWY}} + \min. (ASQ-H)} \times \frac{(2600)}{\text{HDWY}}$$

- B. Maximum RMS I = $\sqrt{\text{(Max. (ASQ-H)} \times \frac{(36001)}{\text{HDWY}}}$
- C. Average I = 6 (Ave. RMS I + Max. RMSI)
 (Amperes/Train) 2

Where:

Ave. (ASQ-H) = Average Substation loading (Column S of TOM-7 Output)

Min. (ASQ-H) = Minimum Substation loading (Column 5 of TOM-7 Output)

Max. (ASQ-H) = Maximum Substation loading (Column 7 of TOM-7 Output)

HDWY = Train operating headway, seconds.

2. Averace Megawatts

Average MM = Ave. I x Voltage at Substitute Bus 10^{6}

2 Hr Loading = Ave. MN x C Transformer - rectifier overload factor

Where: C = 1.2 for end stations
C = 1.1 for monend stations
Transformer rectifier overload factor = 1.5

PHASE II INTERIM STATUS REPORT COMMUNICATIONS JUNE 30, 1989

This report summarizes communications system design work for Phase II of the Metro Rail Transit system accomplished during the work program period ending June 30, 1989. The work tasks were assigned with the understanding that an interim report would be prepared at at the conclusion of Part A, after which the work might be interrupted for a period of a few weeks or months. Initially the interim report was scheduled for April 28, 1989; and was subsequently rescheduled for June 30, 1989, and as of that date all Phase II work was halted. This report briefly addresses tasks that will be resumed, using the work products that are in various stages of completion as of June 30, 1989.

Limited Preliminary Engineering (LPE) refers to a work program in which certain Phase II preliminary design work was done just prior to work summarized in this Interim Report.

Work Planned

Six areas of communications systems work were planned:

1. Preliminary Design Specifications

The equipment specifications developed for MOS-1 will be reviewed for applicability and interface with Phase II procurements. The CUDs developed for Phase II will be refined as required. Development of preliminary specifications will be initiated after contract units are identified. Requirements for compatibility with MOS-1 equipment will be listed and an equipment interface listing will be established for each contract.

2. Radio, CCTV and PA Requirements

Incorporate Limited Preliminary Engineering requirements for radio, CCTV, and PA into equipment concepts.

3. Emergency and Access Management

Establish and refine emergency management, intrusion detection and access control system requirements for Phase II station and vent shafts and develop compatible design concepts for integration into MOS-1 voice and SCADA subsystem.

Seismic and Gas Detection

Establish and incorporate Phase II seismic and gas detection requirements into preliminary specifications.

Redundancy Requirements

Analyze potential requirements of redundant communications during RCC down time.

6. SCADA Integration

Perform analysis of SCADA software and hardware modifications needed for addition of the Phase II system to existing MOS-1 equipment.

Work Not Anticipated

LAPD Radio Requirements

Additional design study became necessary to consider the Los Angeles Police Department radio requirements in the underground portion of the Metro Rail, and to evaluate the design, cost and operational consequences for Phase II.

Work Accomplished and Work Products

1. Preliminary Design Specifications

In the Phase II, Part A activities, work that was begun in the LPE activities was continued, especially in the reviews and analysis of MOS-1 communications designs, for direct or modified applicability into the Phase II designs. The review and analysis extended beyond the design specifications used for procurement of the MOS-1 Communications design, into the design documents submitted by the A640 Contractor. Contractor's designs have advanced to the review portion of Preliminary Design cycle. Using the design information from these design reviews we have started to implement basic detail designs into the Phase II preliminary work. A systems procurement study has been initiated (discussed in a separate interim report), the results of which will affect the composition of design specifications for some or all of the Phase II Communications subsystems. Communications staff support was continuously required to assist in formulating the procurement study alternatives.

2. Radio, CCTV and PA Requirements

A preliminary radio frequency (RF) power budget was developed to assess the power needed for the radio subsystem. The RF power budget is being used to determine base station repeater locations. Early preliminary design of the Communications subsystems were performed to develop approximate equipment quantities, equipment room space requirements and order of magnitude cost estimates.

3. Emergency and Access Management

Conceptual designs were begun, based on review of MOS-1 requirement extrapolations.

The fire detection and suppression requirements have been reviewed by the Fire/Life Safety Committee. Several modifications can be made which may result in fewer monitoring devices, and potentially, some reductions in floor space, wiring, and indications. We are in the process of verifying these potential savings at this time.

4. Seismic and Gas Detection

We have begun estimating gas monitoring locations and analyzer units within each passenger station and tunnel section, based on the consideration that all of Phase II locations are classified as "gassy".

Contractor implementation of the MOS-1 gas monitoring equipment has revealed that the central analyzer units, with necessary peripheral equipment, require more TC&C room space than first considered, and that all the apparatus must be powered by UPS power. These factors must be considered in Phase II equipment.

5. Redundancy Requirements

Consideration has been given to studying means of providing a totally independent means of communicating from underground Metro Rail locations to the "outside world" in the event of a catastrophe that would knock out the normal and emergency communication routes that go through the RCC. No specific work has begun on that study.

6. SCADA Integration

No specific work has been done to integrate the MOS-1 SCADA system across the boundary between it and the Phase II facilities and systems that will be under centralized supervisory control form the RCC. When Phase II design resumes, the task will begin with the assessment of approximately how much parallel capability will be needed at the RCC.

Unanticipated Work Accomplished

LAPD Radio Requirements

The Los Angeles Police Department has requesting additional radio frequency capability to be installed in underground portions of Metro Rail system. The design of this radio system addition is still in its conceptual phase. Major impact on floor space in the TC&C rooms and the communi-

cations equipment rooms in the Rail Control Center is anticipated.

The LAPD radio requirements have not been entered into the RF power budget discussed under #2 above.

PHASE II INTERIM STATUS REPORT

Operations and Maintenance Planning June 30, 1989

I. INTRODUCTION

The O&M discipline provides support to the O&M Committee for Phase II through participation at meetings and as a liaison with MRTC disciplines. Deliverables include a maintainability analysis report, and a maintenance equipment summary report. Due to work performed on the Hollywood Area Pocket Track Study, some work originally planned was deferred.

II. AWP REQUIREMENTS-PART "A"

The AWP requirements for Part "A" work include the following:

- Maintainability analysis of line sections and structures report
- 2. Maintenance equipment summary report

III. ADDITIONAL WORK NOT ANTICIPATED

At the District's request, MRTC was directed to prepare an analysis to determine the optimum location for a pocket track along Hollywood Boulevard. Concerns expressed from the City of Los Angeles relating to potential negative construction impacts on the surrounding businesses have caused a re-examination of the current pocket track location on the west end of the Hollywood/Vine Station.

IV. SUMMARY OF WORK AND DELIVERABLES

 The major work product of the O&M Staff for Part A was preparation of the pocket track study.

Numerous working sessions were held with District representatives to discuss the operational, maintenance, business, construction, traffic and cost impacts related to locating the pocket track.

The Hollywood area pocket track report was prepared in final draft form and distributed for SCRTD to prepare the conclusion and recommendation in April, 1989.

District input on the conclusion and recommendation section was received at MRTC the week of June 19. MRTC has issued the final report.

2. Maintainability Analysis of Line and Structures

The maintainability analysis of line sections and structures has been initiated. Work to date has been identifying various maintenance procedures (e.g. custodial room/closet location access, line sump pump pit clean-out) that can be more easily accommodated through minor design features. Facility design has not yet progressed to the point at allowing completion of the analysis.

Much of the work to date has focused on the discussions and coordination of issues with in-house architects and mechanical discipline staff.

3. Maintenance Equipment Summary Report

The maintenance equipment summary report will be prepared during Part B activities. Budget limitations precluded further Part A work.

V. REVIEW OF WORK BY OTHERS

The O&M discipline has been involved in the review and comment of the following Phase II contracts:

- o Phase II Conceptual Design Review of station Contracts B240, B250, B270, B280, and B300
- o B201 Line Section Alvarado to Vermont Station (In-Progress)
- o B330 Line Section-Universal City to North Hollywood (In Progress)
- o B331 Line Section-Universal City to North Hollywood (In-Progress)

PHASE II INTERIM STATUS REPORT

Safety, Assurance and Security June 30, 1989

I. INTRODUCTION

This report encompasses the verification of emergency exiting capability of the following stations and the determination of the adequacy of the existing DWP water distribution system to supply the required flow/pressure to the fire suppression systems of the following station and line section contracts.

A. RED LINE STATIONS/LINE SECTIONS

- Wilshire/Alvarado Wilshire/Vermont Line Section, with Pocket Track (B201)
- Wilshire/Vermont Station (B211/B215)
- Wilshire/Vermont Vermont/Beverly Line Section and Vermont/Beverly Station, with Crossover (B241)
- 4. Vermont/Beverly Vermont/Sunset Line Section and Vermont/Santa Monica Station (B251)
- 5. Vermont/Sunset Hollywood/Western Line Section and Vermont/Sunset Station, with Crossover (B261)
- Hollywood/Western Station (B271)
- 7. Hollywood/Western Hollywood/Highland Line Section and Hollywood/Vine Station, with Pocket Track (B281)
- 8. Hollywood/Highland Station (B301)
- Universal City Station Ventura Freeway Line Section, with Vent Structure (B331)

B. ORANGE LINE STATIONS/LINE SECTIONS

- Wilshire/Vermont Wilshire/Western Line Section and Wilshire/Normandie Station (B221)
- Wilshire/Western Station, with Crossover and Tailtrack (B231)

II. ANNUAL WORK PLAN REQUIREMENTS - PART "A"

A. EMERGENCY EXITING

Review conceptual station designs to verify conformance to emergency exiting criteria requirements, using approved projected patronage data.

B. WATER SUPPLY ANALYSIS

Perform preliminary hydraulic calculations for station and line section fire suppression systems to determine flow/pressure demands. Review DWP Service Analysis Reports to verify adequacy of existing DWP water distribution system to meet required demands.

III. ADDITIONAL WORK THAT WAS NOT ANTICIPATED

A. MULTIPLE STATION ENTRANCE CONFIGURATIONS

Due to the complexity of Wilshire/Vermont Station siting considerations, multiple station layouts and entrance configurations were proposed by the architectural staff. Layouts of each proposal were reviewed to determine potential impact on emergency exiting times and travel distances.

B. DETERMINE CONCEPTUAL STAIR/ESCALATOR CAPACITY REQUIREMENTS

Using verbal information and generic sketches provided by architectural design staff, an order of magnitude number of required emergency exit lanes was determined for six (6) stations based on patronage data in D-001, Revision 1.

IV. SUMMARY OF WORK AND DELIVERABLES

A. WORK ORIGINATED BY SAFETY, ASSURANCE & SECURITY

- 1. Computer generated exiting calculations and letter reports were developed for seven (7) stations based on input provided by design staff. This information was submitted to design personnel. See Attachments A, A.1, B and C.
- Through coordination with LAFD representatives, MRTC obtained a DWP Service Analysis Report (flow/ pressure report) for the proposed point of connection to the DWP water distribution system at the B331 vent structure.

3. Computer generated hydraulic calculations were developed for the B331 tunnel fire suppression system. Calculations were based on the wet standpipe system design depicted in the prefinal (85%) design review submittal. System flow/pressure demand was compared to existing DWP capability and a letter report was issued indicating compliance with criteria requirements. See Attachment D.

B. REVIEW OF WORK BY OTHERS

1. As a basis for performing preliminary emergency exiting calculations for the Wilshire/Vermont Stations, preliminary architectural drawings and sketches showing proposed station layout, platform plans, ancillary plans, and station longitudinal sections were reviewed. These drawings were provided by architectural personnel. Approximately three (3) different station layouts/entrance configurations were reviewed.

Preliminary calculations for the remaining six (6) Red Line stations covered by this report were based on a verbal description of a generic station, provided by architectural staff. The Phase II final conceptual design drawings distributed for review in May 1989 were not of sufficient detail to perform emergency exiting calculations, therefore none were developed

Projected patronage data used for all preliminary emergency exiting calculations performed for Phase II was that contained in DD-001, Revision 1.

2. As a basis for performing tunnel wet standpipe system hydraulic calculations for Contract B331, the mechanical drawings issued as a part of the prefinal (85%) design review submittal were reviewed. Additionally, the DWP Service Analysis Report obtained through LAFD was reviewed in determining the capability of the tunnel wet standpipe to perform as required.

The design of utilities for the remaining Red Line stations/line sections covered by this report did not progress to a point sufficient to determine the proposed points of connection to the DWP water distribution system. Due to this fact, no work on the task of determining the adequacy of the existing water distribution system was performed.

IV. PLANS FOR FUTURE WORK

A. EMERGENCY EXITING

Preliminary emergency exiting calculations will be developed based on the final design 30% review submittal for the seven (7) Red Line stations covered by this report. Recommendations will be developed to address areas of non-compliance, if any, and to otherwise enhance station emergency exiting. Final emergency exiting calculations will be based on the final design 85% review submittals.

Upon resurrection of design activities for the two (2) Orange Line stations included in this report, the appropriate emergency exiting calculations previously developed and included in the September 1984 Metro Rail Project Station Exiting Calculations Report will be reviewed and refined to reflect revised patronage data from DD-001, Revision 1 and any proposed revisions to station configurations. Final emergency exiting calculations for these stations will be based on the final design 85% review submittals.

B. WATER SUPPLY

Once utilities design for the Red Line stations and line sections is developed to the degree that points of connection to the DWP water distribution system can be determined, DWP Service Analysis Reports for the appropriate locations will be requested through the project LAFD representatives. Station and line section vertical alignment and fire suppression system schematic drawings will be reviewed. Hydraulic calculations will be developed to determine flow/pressure demands at each proposed point of connection. These demands will be compared to the DWP system capability to determine compliance with criteria requirements. A final report will be issued based on the final design 60% review submittal.



RECLIVEL MAR 27 1989

March 23, 1989

DCC FAX (213)622-4670

Mr. Malcolm Ingram Metro Rail Transit Consultants 548 South Spring Street, Seventh Floor Los Angeles, California 90013

WILSHIRE/VERMONT EXIT CALCULATIONS

Malcolm:

Enclosed are the preliminary exit calculations for the Wilshire/Vermont Station with the maximum egress times as follows:

| Location of Discounted Escalator | Egress Time (minutes) |
|----------------------------------|-----------------------|
| | |
| Lower Platform (.LPE) | 4.929 |
| Upper Platform (.UPE) | 4.883 |
| Concourse (.CE) | 4.954 |

All egress times are under 6 minutes and comply with the Fire/Life Safety Criteria.

We have the following comments on the review of the drawings.

| Number | Comment |
|--------|--|
| SKA-12 | Auxiliary Power & Battery Room and Air Supply Room . have openings directly into the emergency exit passageway which are not permitted by Section 3312(a) of the UBC. A vestibule has been previously accepted as an alternate by the Fire/Life Safety Committee for other stations. |

Please give me a call if you have questions.

Sincerely,

Drawing

Christopher L. Vollman, P.E.

CLV:jmp - H3275 Wilshire/Vermont

5252 Hollister Road • Houston, Texas 77040 • 713/462-1840 • FAX 462-0812

| STATION: WILSHIRE NET PLATFOM AREA: COUPANT LOAD CALC | UPPER = | DATE: 3/2 9010 LOV | IER = | BY: 12384 Design yr | EHS |
|---|----------------------|-----------------------|---------------------------------|---------------------------|------------------------------|
| MAK HOUR | | | A.H. | | P.M. |
| LINK LOADS: | ONDOGNI ONDOGTUO | | 11420 5662 | | 4862 9766 |
| ENTRAINING LOADS: | I NBOUND Outbound | | 2963 906 | | 1999 1130 |
| PEAK 15 MINUTE ĻOA | DS [=PEAK HR. LO | AD x 1.1 | 5 /- 43 | | |
| LINK LDADS: | Inbound | | 3284 | | 1:398 |
| | OUTBOUND | | 1628 | | 2908 |
| ENTRAINING LOADS: | INROUND | | 824 | | S 75 |
| | OUTBOUND | | 232 | | 325 |
| PEAK HEADWWY | ENDOUND DAUGOETUG | | 3.0 3.0 | | 3.0 3.0 |
| | TNUORNI DNUORTUO | | TEGER (15 A.M. 657 326 | | DWAY)] P.M. 280 562 |
| PEAK ENTRAINING LO | AD =[PEAK 15 MIN | I. LOAD x | (4 x HE | ADWAY / 15 | MIN.)] |
| | | | A.M. | | P.M. |
| | ONTBORND Inbornd | | 660 186 | | 460 260 |
| TOTAL OCCUPANT LOA | D [=CALCULATED] | | | | LOADI |
| | - | | A.H. | | P.M. |
| | UPPER PLATFORM | | 1506 1 98 0 | | 1580 1780 |
| DENSITY (=NET PLAT | FORM AREA / PEAK | ENTRAIN | ING LOAD A.M. | | Р.М. |
| CNDT < 4 | SQ.FT. / PERSON | | 48.44 18.76 | | 34.65 26.92 |
| STATION OCCUPANT L | DAD (=LDWER + UF | | | | 3360 |
| TOTAL OCCUPANT LOA | D FOR CALCULATIO | INS | 3486 | | |

STATION: WILSHIRE / VERMONT DATE: 3/22/89 BY: EHS

| Ţ | LANES | AND | CAPACITY | PROVIDED |
|---|-------|-----|----------|----------|
|---|-------|-----|----------|----------|

| ELEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | = | PPM | | | | | | |
|---------------------|---------------------------|------------|-------------|-------------------------|------------------|-------|-----------|-----------------|-----------------|--------|------------|---------------|
| Lower Plai | tform to Up | per Platfo | or a | | | | Upper Pla | atform to Conci | ourse | | | |
| Stairs | -up | 4 | 3 - | 35 | = | 420 | Stairs | -uo | 4 | 3 | 35 | 42 |
| | -down | 0 | 0 | 40 | =. | 0 | | -down | 0 | 0 | 40 | |
| Escalators | s-up * | 3 | 2 | 35 | = | 210 | Escalato | rs-up | 4 | 2 | 35 | 28 |
| | -down | 0 | 0 | 40 | = | 0 | | -down | G | 0 | 40 | |
| Emer. | -up | 4 | 4 | 35 | = | 560 | Emer. | -up | 2 | 2 | 3 5 | 14 |
| Stairs | -down | 0 . | 0 | 40 | = | 0 | Stairs | -down | 0 | 0 | 40 | |
| • Discount | ted | | | | | | | | | | | |
| | | | 34 | Total | | 1190 | | | | 24 Tot | al | 84 |
| - | are Barrier | | | | | | - | Fare Barriers | | | | |
| Turnstiles | 5 | 4 | 1 | 25 | = | 100 | Turnstile | es | 4 | 1 | 25 | 10 |
| Fare Gates | 5 | . 0 | 1 | 50 | = | 0 . | Fare Gate | P5 | 0 | 1 | 50 | |
| Service 6a | ates | 1 | 2 | 50 | 3 | 100 | Service (| Gates | 1 | 2 | 50 | 10 |
| Energency | 6ates | · 2 | 2 | 50 . | = | 200 | Emergenc | y Gates | 2 | 2 | 50 | 20 |
| | | | | Total | | 400 | • | | • | Tot | al · | 40 |
| Fare Barri | iers to Saf | e Area (So | uth) | | | | Fare Bar | riers to Safe / | Area (North) | | | |
| ^r airs ' | -up | 2 | 3 | 35 | = | 210 | Stairs | -up | 2 | 3 | 35 | 21 |
| } | -down | 0 | G | 40 | = | Û | | -down | . 0 | 0 | 40 | |
| calators | 5 - up | 2 | 2 | 35 | = | 140 | Escalato | rs-up | 2 | 2 | 35 | 14 |
| | -down | 0 | 0 | 40 | = | 0 | | -down | G . | 0 | 40 | |
| Emer. | -up | 0 | 0 | 35 | = | 0 | Eger. | -up | 0 | Û | 35 | |
| Stairs | -down | 0 | 0 | 40 | = | · | Stairs | -dонп | 6 | 0 | 40 | |
| | | | | Total | | 350 | | | | Tot | al | 35 |
| | | EMERGENCY | EXIT WIDT | H TEST | | | | | RE BARRIER TEST | | | |
| | latform Exi | | | | | | | | Arrav | | outh | North |
| | | | • | | | | Capacity | of Fare Gates | | | 100 | 100 |
| | lform Area idth Requir | | • | n x 50 Person Inwers | s per f 35.38 | Ft.)] | | Percent of To | otal Capacity | 2 | 5.00 | 25.0 0 |

STATION: WILSHIRE /VERMONT

DATE: 3/22/89

BY: EHS

Test 1

Lyacuate Total Occupant Load from Platform(s) in 4 minutes or less.

WI(waiting time at platform exits) = Occupant Load / Exit Capacity

W111 = 1246 1 840 1.483 Minutes WIL = 1980 1190 1.664 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route _____

T = T1 + T2 + T3 + T4 + T5 + T6

| · · | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| Ti (on lower platform) | 90 | 200 | | 0.450 |
| T2 (platform to platform)-up | 3.0 | 50 | | 0.600 |
| T3 (on upper platform) | 54 | 200 | | 0.270 |
| T4 (platform to concourse)-up | 19 | 50 | | 0.380 |
| T5 (on concourse to safe area) | 241 | 200 | | 1.205 |
| Tó (concourse to grade)-up | 40.5 | 50 | | 0.810 |
| | | | | |

] = 3.715

Mitional Waiting Time at Platform Exits

(WIL- TI)= 1.664 0.450 = 1.214 Minutes (W1U-W1L) = 1.483 -1.664 = 0.000 Minutes

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (Lower Platform) - Lower Platform Emergency Stair 4 Minute Capacity

+ Total Occupant Load (Upper Platform) - Upper Platform Emergency Stair 4 Minute Capacity

1980 - (4 x)560) + 1506 - (4 x 140) = 946 Patrons

W2 = Concourse Occupant Load / Sate Capacity Check for Unbalanced Flow North: 473 746 - 7 800 = 1.183 Minutes - / 400 = 1.133 1.664 = 1.183 (W2 - W1) = 1.183 -0.000 Minutes South: 473 400 =

Additional Waiting Time at Concourse Exits

#3 = Concourse Occupant Load / Exit Capacity

946 - 7 700 1.351 Minutes North: 473 350 = 1.351 (W3 - W1) = 1.351 -1.664 = 0.000 Minutes South: 473 1 350 = 1.351

[=T+(M1-T1)+(M1U-W1L)+(W2-M1)+(W3-WE)3 Total Exit Time

4.929 MINUTES [NOT > 6 MINUTES] `TOTAL =

STATION: WILSHIRE /VERMONT DATE:

3/22/89 BY:

EHS

CIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only.

Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

1580 W1U =

B40

1.881 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Waiting Time at Platform Exits _____

(M1U-T3) = 1.881 -

0.270 =

1.611 Minutes

Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Plat-

form Emergency Stair 4 Minute Capacity

1580 - (4 x)

140) =

1020

Patrons

North: Couth:

M2U = W2U =

510 / 510 /

400 = 400 = 1.275 Minutes 1.275 Minutes

...J - W1U= 1.275 -

1.881 =

0.000 Minutes

Waiting Time at Concourse Exits

North:

#3U =

510 /

350 =

1.457 Minutes

South:

W3U =

510 /

350 =

1.457 Minutes

W3U - W1U= 1.457 -

1.881 =

0.000 Minutes

Total Exit Time [=(T3+T4+T5+T6)+(W1U-T3)+(W2U-W1U)+(W3U-W1U)]

Upper Platform ------

Total =

4.276 Minutes [Not > 6 Minutes]

=

Total Exit Time

{=Occupant Load / Emer. Stair Capacity}

Lower Platform

Total = 1980 1 560

3.536 Minutes

| STATION: WILSHIRE NET PLATFOM AREA: IDUPANT LOAD CALC | UPPER = ULATION | 9010 LOWER = | BY: 12384 Design yr | EHS |
|---|---------------------------------------|---------------------------------------|---------------------------|--------------------------------------|
| PEAK HOUR | | A.M. | | P.M. |
| LINK LDADS: | ENDOUND DNUOBTUO | 11420 5662 | | 4862 9766 |
| ENTRAINING LOADS: | INBOUND OUTBOUND | 2863 806 | | 1999 1130 |
| PEAK 15 MINUTE LOA | DS [=PEAK HR. LO | AD x 1.15 / 43 | | |
| LINK LOADS: | INBOUND OUTBOUND | 3284 1628 | | 1398 2808 |
| ENTRAINING LOADS: | I NBOUND Ondoetud | 824 232 | | 575 325 |
| PEAK HEADWWY | I NBOUND Outbou n d | 3.0 | | 3.0 3.0 |
| CALCULATED TRAIN L | | N. LINK LOAD / ()WAYS =INTEGER(15 | | |
| CUSE NOT | INBOUND OUTBOUND (1320) | A.H. 657 326 | | P.M. 280 562 |
| PEAK ENTRAINING LO | AD =[PEAK 15 MIN | I. LOAD x (4 % HE | ADWAY / 15 | HIN.)] |
| | I NBOUND OUTBOUND | A.M. 660 186 | | P.M. 460 260 |
| TOTAL OCCUPANT LOA | D [=CALCULATED] | | | |
| | - UPPER PLATFORM LOWER PLATFORM | | | P.H. 158 0 17 80 |
| DENSITY (=NET PLAT | FORM AREA / PEAK | | | |
| CNOT (4 | SQ.FT. / PERSON | A.M. IJ UPR 48.44 LWR 18.76 | | P.M. 34.65 26.92 |
| STATION OCCUPANT L | DAD [=LOWER + UP | PER] 3486 | | 3360 |
| TOTAL OCCUPANT LOA | D FOR CALCULATIO | ; BNS 3486 | | |

STATION: WILSHIRE / VERMONT DATE: 3/22/89 BY: EHS

| 1 | LANES | AND | CAPACITY | PROV | IDED |
|---|-------|-----|----------|------|------|
| 1 | LANES | HNU | CHPACILI | FRUY | INCI |

| ELEMENT | DIRECTION | NUMBER | * LANES | x CAPACITY / LANE | = | PPM | | | | | | |
|---------------|--|----------|-------------|----------------------|-------------------------------|------|--------------------|---------------|------------------------------|-------|-------|---------|
| | atfore to Upp | |)re | | | | | | Concourse | | | |
| Stairs | -up | 4 | 3 | 35 | = | 420 | Stairs | -up | 4 | 3 | 35 | 42 |
| | -down | 0 | 0 | 40 | = | 0 | | -down | e e | 0 | 40 | |
| Escalator | rs-up | 4 | 2 | 35 | = | 280 | Escalato | rs-up + | 3 | 2 | 35 | 21 |
| | -down | 0 | 0 | 40 | = | 0 | | -down | 0 | 0 | 40 | |
| Ger. | -up | 4 | 4 | 35 | = | 560 | Emer. | -up | 2 | 2 | 35 | 14 |
| Stairs | -down | 0 | 0 | 40 | = | 0 | Stairs + Discou | -down nted | 0 | 0 | 40 | |
| | | | 36 | Total | | 1260 | | | • | 22 To | tal | 77 |
| | are Barriers | | | | | | - | | iers (North) | | | |
| Turnstile | | 4 | 1 | . 25 | = | 100 | Turnstil | | 4 | 1 | 25 | 10 |
| Fare Gate | 25 | 0 | 1 | 50 | = : | 0 | Fare Gat | es | 0 | 1 | 50 | |
| Service (| Gates | 1 | 2 | 50 | = | 100 | Service | Gates | 1 - | ·2 | 50 | 10 |
| Emergency | y Gates | 2 | 2 | 50 | = . | 200 | Emergenc | v Gates | 2 | 2 | - 50 | 20 |
| | | | | Tot al | | 400 | | | | To | tal | 40 |
| Fare Barr | riers to Safe | Area (Sc | outh) | | | | | | Safe Area (North) | | | |
| ^\airs | -up | 2 | 3 | 35 | = | 210 | Stairs | -up | 2 | 3 | 35 | 21 |
| | -down | 0 | 0 | 40 | 2 | O | | -down | 0 | O | 40 | |
| icalator | • | 2 | 2 | 35 | = | 140 | Escalato | - | 2 . | 2 | 35 | 14 |
| _ | -dawn | 0 | 0 | 40 | = | 0 | _ | -down | 0 | 0 | 40 | |
| Eeer. | -up | 0 | 0 | 35 | = | 0 | Emer. | -up | 0 | 0 | 35 | |
| Stairs | -down | 0 | 0 | 40 | 2 | 0 | Stairs | -down | | 0 | 40 | |
| | | | | Total | | 350 | | - | | To | tal | 35 |
| | E | MERGENCY | EXIT WIDT | H TEST | | | | | FARE BARRIER TES | ī | | |
| Minieue f | - Platfore Exit | Width | · - | | | | | | Array | • | South | North |
| | | | | | | | Capacity | | Gates and Turn s tile | | 100 | 100 |
| Miniaua 1 | atform Area / Width Require ovided: Up.= | d : Up.= | 25.74 | | is per f 35.38 IDT{REDI | | | Fercent | of Total Capacity | | 25.00 | 25.00 |

STATION: WILSHIRE /VERMONT

DATE: 3/22/89

BY: EHS

Test 1

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Wi(waiting time at platform exits) = Occupant Load / Exit Capacity

W1U = 1246 / 770 = 1.618 Minutes W1L = 1980 / 1260 = 1.571 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T2 + T3 + T4 + T5 + T6

| • | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| T1 (on lower platform) | 90 | 200 | | 0.450 |
| T2 (platform to platform)-up | 30 | 50 | | 0.600 |
| T3 (on upper platform) | 54 | 200 | | 0.270 |
| T4 (platform to concourse)-up | 19 | 50 | | 0.380 |
| TS (on concourse to safe area) | 241 | 200 | | 1.205 |
| Tó (concourse to grade)-up | 40.5 | 50 | | 0.810 |
| • | | | | |

T = 3.715

'ditional Waiting Time at Platform Exits

(W1L- T1)= 1.571 - 0.450 = 1.121 Minutes (W1U-W1L)= 1.618 - 1.571 = 0.047 Minutes

Additional Waiting Time at Fare Barrier

1980 - (4 x

Occupant Load at Concourse = Total Occupant Load (Lower Platform) - Lower Platform Emergency Stair 4 Minute Capacity + Total Occupant Load (Upper Platform) - Upper Platform Emergency Stair 4 Minute Capacity

- (4 x

| W2 = Conco | urse Occ | upant L | oad / Gate Cap | nacity | | | C | h eck fo | r Unbalanc | ed Flow | |
|------------|-------------|---------|----------------|-------------|-------|---------|--------|-----------------|------------|---------|-------|
| W2 = | 946 | 1 | 800 | = | 1.183 | Minutes | North: | 473 | 1 | 400 = | 1.183 |
| (W2 - W1)= | 1.183 | - | 1.619 | = | 0.000 | Minutes | South: | 473 | / | 400 = | 1.103 |
| Additional | Waiting | Time at | t Concourse Ex | it s | | | | | • | | |

140) =

Patrons

W3 = Concourse Occupant Load / Exit Capacity

560

) +

1506

945 700 = 1.351 North: 350 = 1.351 Minutes 473 (N3 - N1) = 1.351 -1.618 = 0.000 473 350 = Minutes South: ŧ 1.351

Total Exit Time [=T+(W1-T1)+(W1U-W1L)+(W2-W1)+(W3-W1)]

TOTAL = 4.883 MINUTES [NOT > 6 MINUTES]

STATION: WILSHIRE /VERMONT DATE: 3/22/89 BY:

EHS

CIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only.

Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

1580 / 770 = W1U =

2.052 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in & minutes or less.

Waiting Time at Platform Exits

(W1U-T3) = 2.052 -

0,270 = 1.782 Minutes

Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Platform Emergency Stair 4 Minute Capacity

1580 - (4 x

140) =

1020 Patrons

North: Couth:

South:

W2U = **#2U =**

510 / 510 /

400 = 400 =

1.275 Minutes

1.275 Minutes

u = W1U = 1.275 = 2.052 = 0.000 Minutes

Waiting Time at Concourse Exits

North:

M38 = W38 =

510 / 510 /

350 = 350 =

1.457 Minutes 1.457 Minutes

W3U - W1U= 1.457 -

0.000 Minutes

Total Exit Time [=(T3+T4+T5+T6)+(M1U-T3)+(M2U-M1U)+(M3U-M1U)]

Upper Platfore -----

Total=

4.447 Minutes [Not > 6 Minutes]

Total Exit Time

(=Occupant Load / Emer. Stair Capacity)

2.052 =

Lower Platfore -----

1980 / Total =

560 =

3.536 Minutes

| STATION: WILSHIRE NET PLATFOM AREA: COCUPANT LOAD CALCU | | DATE: 3/22/89 9010 LOWER = | BY: 12384 Design yr | EHS |
|---|-----------------------|-------------------------------|---------------------------|----------------|
| -cax Hour | | A.M | • | P.M. |
| LINK LDAÐS: | INBOUND | 11420 | | 4862 |
| | OUTBOUND | 5662 | | 9766 |
| ENTRAINING LOADS: | | 2863 | | 1999 |
| | OUTBOUND | 806 | | 1130 |
| PEAK IS MINUTE LOAD |)S (=PEAK HR. LO | AD x 1.15 / 41 | | |
| LINK LDADS: | INBOUND | 3284 | | 1398 |
| | OUTBOUNO | 1628 | | 2808 |
| ENTRAINING LOADS: | INBOUND | B24 | | 575 |
| | ONTBOUND | 232 | | 32 5 |
| PEAK HEADWWY | I NBOUND | 3.0 | | 3.0 |
| | OUTBOUND | 3.0 | | 3.0 |
| CALCULATED TRAIN LO | | | | |
| | | A.M | | P.M. |
| | ONDOORD Chroatro | 657 326 | | 280 562 |
| . CUSE NOT | | 320 | | 302 |
| | | 1045 /4 11 | F. B. W. B. J. J. F. B. | |
| PEAK ENTRAINING LOA | 10 = EMERK 12 MIN | . LUAU X 14 X A | | ני.אור P.M. |
| | INBOUND | 660 | | 460 |
| | ONTBOUND | . 186 | | 260 |
| TOTAL OCCUPANT LOAD |) (=CALCULATED T | RAIN LOAD + PEA | K ENTRAINING | LOAD] |
| | - | A. H | • | P.M. |
| | UPPER PLATFORM | 1506 | | 1580 |
| | LOWER PLATFORM | 1980 | | 1780 |
| DENSITY (=NET PLATE | ORM AREA / PEAK | | | • |
| | | A.M | - | P.M. |
| CNUT (4 | SQ.FT. / PERSON | | | 34.65 |
| | | LWR 18.76 | | 26.92 |
| STATION OCCUPANT LO | JAD [=LOWER + UP | PER) 3486 | | 3340 |
| TOTAL OCCUPANT LOAD | FOR CALCULATIO | NS 3486 | | |

Width Provided: Up.= 44.00 Lower= 66.00 [NDT(REQUIRED)

STATION: WILSHIRE /VERMONT DATE: 3/22/89 BY: EHS

TYIT LANES AND CAPACITY PROVIDED

| ELEMENT | DIRECTION | NUMBER | * LANES | x CAPACITY / LANE | =, | PPM | | | | |
|--------------------|---------------------|--------------|-----------|-------------------|------------|------|-------------------------|-----------------|----------|-------|
| | | lpper Platfo | rs | | | | Upper Platform to Conce | | | |
| Stairs | -up | 4 | . 3 | 35 | = | 420 | Stairs -up | 4 | 3 3: | 5 420 |
| | -down | 0 | 0 | 40 | = | 0 | -d own | 0 | 0 4 | 0 0 |
| Escalator | rs-up | 4 | 2 | 3 5 | = | 280 | Escalators-up | 4 | 2 33 | 5 280 |
| | -down | 0 | 0 | 40 | = | 0 | -down | 0 | 0 4 | 0 (|
| Emer. | -up | 4 | 4 | 35 | = | 560 | Emerup | 2 | 2 3 | 5 140 |
| Stairs | -qown | .0 | 0 | 40 | = | 0 | Stairs -down | 0 . | 0 4 | 0 (|
| | | | 36 - | Total | | 1260 | | : | 24 Total | 840 |
| • | Fare Barrie | | | | | | Through Fare Barriers | | | |
| Turnstil | 25 | 4 | 1 | 25 | 2 | 100 | Turnstiles | 4 | 1 · 2 | 5 100 |
| Fare Gati | es · | 0 | 1 | 50 | = | . 0 | Fare Gates | 0 | 1 5 | 0 (|
| Service (| Gates | -1 | 2 | 50 | = | 100 | Service Gates | i | 2 5 | 0 10 |
| Energenc | y Gates | 2 | 2 | 50 | = . | 200 | Emergency Gates | 2 | 2 5 | 0 200 |
| | | | | Total | | 400 | | | Total | 400 |
| | riers to Sa | ife Area (Sc | uth) | | | | Fare Barriers to Safe | | | |
| ^c täirs | -up | 2 | 3 | 35 | = | 210 | Stairs -up | 2 | 3 3 | 5 210 |
| | -down | 0 | 0 | 40 | = | 0 | -down | 0 | 0 4 | 0 (|
| ical ato | rs-up ŧ | 1 | 2 | 35 | = | 70 | Escalators-up · | 2 | 2 3 | 5 140 |
| | -down | 0 | 0 | 40 | = | 0 | down | . 0 | 0 4 | 0 (|
| Emer. | -up | 0 | 0 | 35 | = | . 0 | Emerup | 0 | 0 3 | 5 (|
| Stairs | -doxn | 0 | 0 | 40 | = | 0 | Stairs -down | 0 | 0 4 | 0 (|
| ŧ Discou | nted | | | | | | | | | |
| | | | | Total | | 280 | | | Total | 350 |
| | | EMERGENCY | EXIT WIDT | H TEST | | | . Fai | RE ØARRIER TEST | | |
| | Platfor ≡ Ex | | | | | | | Arrav | South | North |
| | | /(7Sq.Ft. | • | | | | Capacity of Fare Gates | and Turnstiles | 100 | 100 |

______ STATION: WILSHIRE /VERMONT

DATE: 3/22/89

BY: EHS

Test 1

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Willwaiting time at platform exits) = Occupant Load / Exit Capacity

W1U = 1246 840 1.483 Minutes WIL = 1980 1.571 Minutes 1260 Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

| T = T1 + | T2 + T | 3 + T | 4 + T | '5 + 1 | 6 |
|----------|--------|-------|-------|--------|---|
|----------|--------|-------|-------|--------|---|

| •• | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| Il (on lower platform) | 90 | 200 | | 0.450 |
| T2 (platform to platform)-up | 30 | 50 | | 0.600 |
| T3 (on upper platform) | 54 | 200 | | 0.270 |
| T4 (platform to concourse)-up | 19 | 50 | | 0.380 |
| T5 (on concourse to safe area) | 241 | 200 | | 1.205 |
| 76 (concourse to grade)-up | 40.5 | 50 | | 0.810 |
| | | | | |

T = 3.715

· itional Waiting Time at Platform Exits

0.450 = (WIL- TI)= 1.571 1.121 Minutes (W1U-W1L)= 1.483 -1.571 = 0.000 Minutes

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (Lower Platform) - Lower Platform Emergency Stair 4 Minute Capacity + Total Occupant Load (Upper Platform) - Upper Platform Emergency Stair 4 Minute Capacity

1980 - (4 x 560) + - (4 x 140) = 946 Patrons 1506

W2 = Concourse Occupant Load / Gate Capacity Check for Unbalanced Flow North: 473 - 7 400 = 1.183 W2 = .9461 1.183 Minutes 1.571 = South: 473 400 = 1.183 (W2 - W1) = 1.183 -I0.000 Minutes

Additional Waiting Time at Concourse Exits

W3 = Concourse Occupant Load / Exit Capacity

350 = 1.351 473 W3 = 946 - / 630 = 1.502 Minutes North: (W3 - W1) = 1.689 -1.571 = 0.118 Minutes South: 473 280 = 1.689

[=T+(N1-T1)+(N1U-N1L)+(N2-N1)+(N3-N1)] Total Exit Time

TOTAL = 4.954 MINUTES [NOT > 6 MINUTES]

STATION: WILSHIRE /VERMONT DATE:

3/22/89 8Y:

CIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only.

Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

1580 / W1U =

840 =

1.001 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Naiting Time at Platform Exits .

(N1U-T3)= 1.881 -

0.270 =

1.611 Minutes

Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Platform Emergency Stair 4 Minute Capacity

1580 - (4 x

140) =

1020 Patrons

₩2U = North:

510 /

400 =

1.275 Minutes

South:

W2U =

510 /

400 =

1.275 Minutes

J - ₩10= 1.275 - 1.001 =

0.000 Minutes

Waiting Time at Concourse Exits

North:

₩3U =

510 /

350 =

1.457 Minutes

W3U = South:

510 /

280 =

1.021 Minutes

W3U - W1U= 1.821 - 1.881 =

0.000 Minutes

Total Exit Time [=(T3+T4+T5+T6)+(W1U-T3)+(W2U-W1U)+(W3U-W1U)]

Upper Platfors

Total = 4.276 Minutes [Not > 6 Minutes]

Total Exit Time

(=Occupant Load / Emer. Stair Capacity)

Lower Platform

Total = 1980 /

560

3.536 Minutes



Rolf Jensen & Associates, Inc.

FIRE PROTECTION ENGINEERS • BUILDING CODE CONSULTANTS

June 21, 1989

FEDERAL EXPRESS (213)612-7000

Mr. Malcolm Ingram Metro Rail Transit Consultants 548 South Spring Street, 7th Floor Los Angeles, California 90013

WILSHIRE/VERMONT PRELIMINARY ARCHITECTURAL REVIEW

Malcolm:

We have reviewed the drawings and sketches which accompanied your speed letter of June 9, 1989.

Updated exit calculations are attached. In all three sets, one escalator was discounted. Maximum egress times are as follows:

| Discounted Escalator at | Egress Time, Minutes |
|-------------------------|----------------------|
| Lower Platform (.LPE) | 6.378 |
| Upper Platform (.UPE) | 6.891 |
| Concourse (.CE) | 6.338 |

All of the total exit times exceed 6 minutes. The exit capacity does not meet the Fire/Life Safety Criteria. Upper platform exiting capacity needs to be increased.

We have the following comments from our review of the drawings:

| Ref No. | Drawing | Comment |
|---------|------------------|--|
| 1 | SKA-02 SKA-07 | Guardrails are needed opposite doors from ancillary spaces to trainway. |
| 2 | SKA-12 SKA-15 | In Aux. Power Room batteries should be separated from other equipment for ventilation purposes. |
| 3 | SKA-13 | Ventilation and generator exhaust may be a problem. Another shaft may be needed to serve the emergency generator room. |

Ref No. Drawing

Comment

A SKA-25 The lower platform is more than 80 feet below finished grade. Protected level separation or other special protection features will be needed to comply with Fire/Life Safety Criteria 2.2.2.3.

If you have a question or would like to discuss our comments, please call.

Sincerely,

David R. Fiedler, P.E.

DRF: jmp - Wilshire/Vermont

Enclosure

\$381C

| _AK_HOUR | A.M. | P.M. |
|--------------------------------|-----------------------------|-------------------|
| LINK LOADS. INDOM | | |
| LINK LOADS: INBOU | | 4862 |
| OATUO | UND 5662 | 9766 |
| ENTRAINING LOADS: INBOU | ND 2843 UND . 806 | 1999 1130 |
| | | 1100 |
| PEAK 15 MINUTE LOADS [=PE | AK HR. LOAD x 1.15 / 4] | • |
| LINK LOADS: INBOU | | 1398 |
| OBTUC OBTUC | UND 1628 | 2608 |
| ENTRAINING LOADS: INBOU | ND 824 | 575 |
| 00100 | UND 232 | 325 |
| PEAK HEADWHY INBOU | 4D 3.0 | 3.0 |
| 08180 | UND 3.0 | 3.0 |
| CALCULATED TRAIN LOAD (=FI | . OF HEADWAYS =INTEGER(15 | MIN. / HEASWAY)] |
| INBOU | A.M. 457 AST | |
| DUTED | | |
| [UBE NOT(1320] | | , |
| , PEAK ENTRAINING LOAD =CPE | AK 15 MIN. LOAD x (4 x HE | AGNAY / IS MIN.)] |
| | А.н. | |
| INBOU | | |
| 0 8190 | UND ISo | 269 |
| TOTAL OCCUPANT LOAD (=SAL | | |
| HEIFE | PLATFORM 1506 | P.M. 1560 |
| | FLATFORM 1580 | 1730 |
| DENSITY CONET PLATFORM AR | | |
| [NOT / A SO ST | 4.8. 7 PERSON) UPR 51.08 | |
| 1001 5 7 5g.Fl. | LWR 22.16 | 31.79 |
| STATION RECUPANT LOAD (=L | DWER + UPPER) 3486 | 3360 |
| TOTAL OCCUPANT LOAD FOR C | ALOVLATIONS 3486 | |

STATION: WILSHIRE / VERMONT DATE: 6/21/89 BY: CAF

| CXII CHICE MILE ON HOLLI HOLLED | EXII | LANES | AND | CAPACITY | PROVIDED |
|---------------------------------|------|-------|-----|----------|----------|
|---------------------------------|------|-------|-----|----------|----------|

| ELEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | = | PPM | | | | | | |
|-----------|-------------------|-------------------|-----------|----------------------|----------|------|----------|---------------|------------------|--------|---------|-----------------|
| | atform to U | | | | | | pbter bl | atform to Con | Cour s e | | | |
| Stairs | -up | 2 | 3 | 35 | 3 | 210 | Stairs | -ир | 2 | 5 | 35 | 210 |
| | -down | 0 | 0 | 40 | = | 0 | | -down | 0 | 0 | 40 | (|
| Escalato: | rs-up # | 3 | 2 | 35 | = | 210 | Escalato | rs-up | 2 | 2 | 35 | 140 |
| | -фомп | 0 | 0 | 40 | = | Ü | | -gonu | ę. | 0 | 40 | 0 |
| Eser. | -up | 4 | 4 | 35 | = | 560 | Eger. | · r | 2 | 2 | 35 | 149 |
| Stairs | | Ù | 0 | 40 | = | 0 | Stairs | -down | 0 | 0 | 40 | 0 |
| * Discou | nted | | | | | | | | | | | |
| | | _ | 28 | Total | | 980 | | | | 14 Tot | al | 470 |
| Through | Fare Barrie | rs (South) | | | | | • | Fare Barriers | | | | |
| Turnstil | es | 4 | 1 | 25 | = | 100 | Turnstil | PS | 4 | 1 | 25 | 100 |
| Fare Gat | 25 | 0 | 1 | 50 | = | 9 | Fare Gat | PS | 0 | 1 | 50 | 0 |
| Service | ûat es | Û | 2 | 50 | = | Ú | Service | Gates ' | 0 | 2 | 50 | (|
| Ewergenc | y Gates | 1 | 2 | 50 | = | 100 | Emergenc | y Gates | Ī | 2 | 50 | 100 |
| Fare Aar | riers to Sa | fe årea iSo | uth) | Total | | 200 | Fare Bar | riers to Safe | Arpa (North) | Tol | al | 2 <u>0</u> 0 |
| | | | | | | | | | | | | |
| Stairs | -up | 2 | 3 | 35 | = | 210 | Stairs | -up | 2 | 3 | 35 | 210 |
| | -down | Û | Ç | 40 | = | Û | | -down | 0· | 9 | 40 | Û |
| calato | re-up | 2 | 5 | 35 | = | 140 | Escalato | • | 2 | 2 | 35 | 140 |
| | -down | 0 | ٥ | 40 | = | ŷ | | -down | Ú | Û | 40 | 9 |
| Eser. | -us | Û | ý | 35 | = | Ĵ | Eaer. | | Ď. | ů | 35 | í, |
| Stairs | -down | O | 0 | 40 | = | 0 | Stairs | −dawn | 6 | ŷ. | 49 | û - - |
| | | | | Total | | 350 | | | | Tai | al | 350 |
| | | EMERGENCY | EXIT WID | TH TEST | | | | | ARE BARRIER TEST | | | |
| Minimum' | Platfora Ex | it width | | | | | | | Array | ; | loutn | Nertn |
| | | | | | | | Capacity | | s and Turnstile: | | 1.0 | 100 |
| [=Net Pl | atform Area | /(78 q.Ft. | per Perso | oo x 50 Ferson | S OFF F | 7.11 | | Porcent of | Total Capacity | | (a) (b) | 50.00 |

STATION: WILSHIRE / VERMONT

DATE: 6/21/89

BY: CAF

Test 1

.vacuate Total Occupant Load from Platform(s) in 4 minutes or less.

W1(waiting time at platform exits) = Occupant Load / Exit Capacity

W1U = 1506 490 3.073 Minutes W1L = 1980 - 1 980 2.020 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T2 + T3 + T4 + T5 + T6

| | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| Ii (on lower platform) | 76 | 200 | | 0.480 |
| 12 (platform to platform)-up | 50 | 50 | | 0.600 |
| T3 (on upper platform) | 142 | 260 | | 0.710 |
| T4 (platform to concourse)-up | 21 | 50 | | 0.420 |
| 15 (on concourse to safe area) | 175 | 200 | | 0.975 |
| Tó (concourse to grade)-up | 26 | 50 | | 9.800 |
| | | | | |

T = 3.785

Additional Waiting Time at Platform Exits .---

0.490 = (M1L- J1) = 2,020 -(WiB-WiL)= 3.073 -2.020 =

1.540 Minutes 1.053 Minutes

Additional Wasting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (Lower Platform) - Lower Platform Emergency Stair 4 Minute Capacity - Total Occupant Load (Upper Platform) - Goper Platform Emergency Stair 4 Minute Capacity

1506 - (4 x

| W2 = Cancou | inse Godi | up a nt Lo | ad / Gate Cap | pacity | | | 21 | ieck fa | r Gobelanci | ed flow | • |
|-------------|-----------|-------------------|---------------|--------|--------|---------|---------|---------|-------------|---------|-------|
| w2 = | 946 | I | 400 | Ξ | 2, 365 | Hinutes | Not the | 473 | | 29€ = | 2.Je: |
| 92 - Wille | 2.345 | - | 3.073 | = | 0.500 | Minutes | South: | 173 | I | 206 ≠ | 5.7.0 |

145) =

946 Satrons

Additional Waiting Time at Concourse Exits

#3 = Concourse Occupant Load / Exit Capacity

700 = North: 473 W3 = 946 - 7 1.351 Minutes 759 = 1.351 (83 - 81) = 1.351 -3.073 = 6.000 Minutes South: 470 J50 = 1.351

Total Exit Time [=T+(W1-T1)+(W1H-W1L)+(W2-W1)+(W3-W1)]

560) +

1980 - 14 z

TOTAL = 6.378 MINUTES [NOT 2.5 MINUTES]

STATION: WILSHIRE /VERNONT DATE:

6/21/89 BY:

CAF

"DECIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only. Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

1580 318 =

490

3.224 Minutes

·Test 2

Evacuate Istal Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Waiting Time at Platform Exits

(W10-T3) = 3.224 -

9.710 =

2.514 Minutes

Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Platform Emergency Stair 4 Minute Capacity

 $1580 - 14 \times$ 140) = 1020 Patrons

North: W2U = 510 / 200 = 2,550 Minutes South: W20 = 510 / 200 = 2.550 Minutes

9 - W10= 2.550 - 3.224 = 0.000 Minutes

Waiting Time at Concourse Exits

North: ¥39 = 510 / 350 = 1.457 Minutes พริช = 51) 1.457 South: 350 = Minutes

W3U - W1U= 1.457 -3.224 = 0.000 Minutes

Total Exit Time (=(T3+T4+T5+T6)-(W1U-T3)+(W2U-W1U)+(W3U-W1U)]

Upper Platfora

Total= 5.219 Minutes [Not > 6 Minutes]

Total Exit Time I=Occupant Load / Emer. Stair Capacity1

Lower Flatform

Total = 1980 · / 560 = 3.536 Minutes

| STATION: MET PLATFOM AREA: OCCUPANT LOAD CALC | UPPER = ULATION | BATE: ## 9501 LO | 21/8 약 WER = | BY: 14624 DESIGN YR | CAF |
|---|-----------------------|----------------------------|------------------------|---------------------------|---------------|
| AK HOUR | | | A.M. | | F.M. |
| LINK LOADS: | | | 11420 | | 4862 |
| | DUTBOUND | | 5662 | | 9756 |
| ENTRAINING LOADS: | | | 2853 | | 1795 |
| | OUTBOUND | - | 80£ | | 1130 |
| PEAK 15 MINUTE LOAD | DS [=PEAK HR. LD: | AD x 1.1 | 5 / 4] | | |
| LINK LOADS: | INBOUND | | 3284 | | 1398 |
| | ENUCATUG | | 1528 | | 2868 |
| ENTRAINING LOADS: | INSOUND | | 324 | | 575 |
| | GUTBOUNG | | 523 | - | 325 |
| PEAK HEADHWY | INBOUND | | 3.0 | | 3.6 |
| | OUTSGUND | | 3.0 | | 3.0 |
| CALCULATED TRAIN L | | | | MIN. / HEAD | |
| | INSGUNE | | 657 | | 280 |
| CUSE NOT | 00780UND (1320] | | 326 | | 562 |
| - MEAK ENTRAINING LOI | AB ={PFAV :5 MIN | 1 GAG ~ | 41 - HF | ΔΩΝΑΥ / 15) | II AID |
| | | L LUND " | A. H. | | F. 1. |
| | INSOUND | | 580 | | 460 |
| | QNUQQTUG | | 186 | | 250 |
| TOTAL OCCUPANT LOAD | D [=CALOULATEO] | RAIN LEA | I + PEAK | | |
| | • | | ń.M. | | F.M. |
| | JPPER PLATFORM | | | | 1580 |
| | LOWER FLATFORM | | 1980 | | 1780 |
| SENSITY (=NET PLATE | FORM AFEA / FEAK | ENTRAIN | | | E. 14 |
| CHOY / A | CO ET / DEDECM | 1 1166 | A. M. | | P.M. 35.54 |
| (10) (4 | SD.FT. / PERSON | | 22.16 | | 31.79 |
| STATION DOCUPANT L | DAD (=LOWER + UP: | PER) | 3485 | · | 376) |
| TOTAL DESUFANT LOAD | D FOR CALCULATION | NS | 3486 | | |

width Provided: Up.= 22.00 Lower= 55.00 [NOT(REDUIFE0]

SHT 2 OF 4 WVDYCAF.UPE

STATION: WILSHIRE /VERMONT DATE: 6/21/89 BY: CAF

| EXIT | LANES | AND | CAPAC1TY | PROVIDED |
|------|-------|-----|----------|----------|
| | | | | |

| ELEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | · = | PPM | | | | | | |
|----------|--------------|-----------|---------|----------------------|------------|---------------|--------------|---------------|------------------|-------|-------|-------|
| | atform to Up | • | | | | | | atform to Con | | | | |
| Stairs | -up | 2 | 3 | 35 | = | 210 | Stairs | | 2 | 3 | 35 | 210 |
| | -down | ù | 0 . | 40 | = | ŷ. | | -down | ð | 0 | 40 | . 0 |
| Escalato | rs-บุติ | 4 | 2 | 35 | = | 290 | Escalato | rs-up ₹ | 1 | 2 | 35 | 70 |
| | -down | 0 | 6 | 49 | = | Û | | -down | · G | j | 40 | 0 |
| Eger. | -up | 4 | 4 | 35 | = . | 560 | Eaer. | -սր | 2 | 2 | 35 | 14ù |
| Stairs | -dewn | 0 | ũ | 40 | = | O | Stairs | | ù | 0 | 40 | 0 |
| | | | | | | | + Discou | nted | | | | |
| | | | 30 | Total | | 19 5 0 | | | | 12 To | tal | 420 |
| - | Fare Bàrrie | | | | | | - | Fare Barriers | | | | |
| Turnstil | | 4 | 1 | 35 | = | 100 | Turnstil | | 4 | 1 | 25 | 100 |
| Fare Gat | | 0 | 1 | | = | 0 | Fare Bat | es | 0 - | 1 | 50 | ٥ |
| Service | Gates | 0 | 2 | 50 | = | 0 | Service | Gates | Ĉ. | 2 | 50 | 0 |
| Emergenc | y Gates | 1 | 2 | 50 | = | | E∎ergenc | y Bates | 1 | 2 | 50 | 100 |
| | | | | Total | | 200 | | | | 1 n | tal . | 200 |
| | riers to Sam | | outh) | , | | - | | | Area (North) | | | |
| Stairs | | 2 | 3 | 35 | = | 210 | Stairs | | 2 | 3 | 35 | - 210 |
| | -down | 0 | Û | 40 | 2 | 0 | | -down | ŷ | 0 | . 40 | 0 |
| :al ato | rs-up | | 2 | 35 | = | 140 | Escalato | rs-up | 2 | 2 | 35 | 146 |
| | -down | | | 40 | = | 9 | | -do#n | 0 | û | 40 | Û |
| Emer. | | 0 | | 35 | = | 0 | Emer. | -ut | Ç- | Ú | 35 | ÷ |
| Stairs | -down | 9 | 9 | ‡0 | = | ŷ | Stairs | -фонк | Ú | Û | 40 | Ģ. |
| | | | | Total | | 350 | | , | | To | tai . | 350 |
| | | EMERGENCY | | | | | | F | ARE BARFIER TEST | Ī | | • |
| Mintala | flatform Ex | | | | | | | • | heray | | South | Nort5 |
| | | | | | | | Sapacity | of Fara Gate | s and Turnstile | | | |
| | skinea k | 1135. Ck | | on a 50 Person | | . | , - , | | Total Capacity | | 50.00 | |

STATION: WILSHIRE /VERMONT

DATE: 6/21/89

BY: CAF

Test 1

.vacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Wilwaiting time at platform exits) = Occupant Load / Exit Capacity

WiU = 1506 / 420 = 3.586 Minutes WIL = 1980 / 1050 = 1.886 Minutes Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = 11 + 12 + 13 + 14 + 15 + 16

| | | Feet | / FPM | = | Minutes |
|--------------|--------------------|------|-------|---|---------|
| II ion lower | platform) | 96 | 200 | | 0.480 |
| T2 (platform | to platform)-up | 20 | 50 | | 0.600 |
| T3 (on upper | platforal | 142 | 200 | | 0.710 |
| T4 (platform | to concourse)-up | 21 | 50 | | 0.420 |
| T5 (on conco | urse to safe area) | 195 | 200 | | 0.975 |
| T6 (concours | e to grade)-up | 30 | 50 | | 0.600 |
| | | | | | |

T = 3.785

Additional Waiting Time at Platform Exits

(W1L- T1)= 1.885 -

0.480 =

1.405 Minutes 1.700 Minutes

(W1U-N1L) = 3.586 - 1.886 =

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (Lower Platform) - Lower Platform Emergency Stair 4 Himste Capacity + Total Occupant Load (Upper Platform) - Upper Platform Emergency Stair 4 Himste Capacity

| 1980 - (4 x | 550 3 + | 1506 - 14 x | 140) = | , 1945 Fatrons |
|-------------|---------|-------------|---------|----------------|
| | | | | |

W2 = Concourse Occupant Load / Gate Capacity Check for Unbalanced Flow
W2 = 946 / 400 = 2.365 Hinutes North: 473 / 200 = 2.365
IW2 - W1) = 2.365 - 3.586 = 0.000 Minutes South: 471 / 100 = 2.365

Additional Waiting Time at Concourse Exits

W3 = Concourse Occupant Load / Exit Capacity

W3 = 746 / 700 = 1.331 Minutes Morth: 473 / 350 = 1.351 (W3 - W1) = 1.351 - 3.586 = 0.000 Minutes 5outh: 477 / 359 = 1.351

TOTAL = 4.891 MINUTES (NOT) & MINUTES)

EMERGENCY EXITING CALCULATIONS

SHT 4 OF 4 WYDYCAF.UPE

STATION: WILSHIRE /VERMONT DATE:

6/21/89 BY:

CAF

PECIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only.

Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

WIU =

1580

420

3.762 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in & minutes or less.

Waiting Time at Platform Exits

(N1U-73) = 3.762 -

0.710 =

3.052 Minutes

Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Platform Emergency Stair 4 Minute Capacity

1020 Patrons 1580 - (4 x)140) =

W2U = 510 / 200 = 2.550 Minutes North: South: ₩2U = 510 / 190 = 2.550 Minutes

0.000 Minutes U - W1U= 2.550 - 3.762 =

Waiting Time at Concourse Exits

North: พ3ช ≎ W3U = South:

510 / 510 / 350 = 350 =

1.457 Hinutes 1.457 Minutes

W3U - W1U= 1.457 -

3.752 =

0.000 Minutes

Total Exit Time (=(TI+T4+T5+T6)+(W1U-T3)+(W2U-W1U)+(W3U-W1U)]

Upper Platform

Total = 5.757 Minutes [Not > 6 Minutes]

[=Occupant Load / Emer. Stair Capacity] Total Exit Time

Lower Flatform

Total = 1980 560

-3.536 Minutes

| STATION: NET PLATFOM AREA: OCCUPANT LOAD CALCE | UPPER = ULATION | | LDWER = . | BY: 14624 DESIGN YR | CAF |
|--|----------------------|------|---------------------|---------------------------|----------------------|
| EAK HOUR | | | A.M. | | F.M. |
| LINK LOADS: | DNUOBTUO DNUOBTUO | | 11420 5662 | | 4852 97 <i>66</i> |
| ENTRAINING LOADS: | INBOUND OUTBOUND | | 2363 806 | | 1999 1130 |
| PEAK 15 MINUTE LOAD | S [=PEAK HR. LOF | B z | 1.15 / 41 | , | |
| LINK LOADS: | INBOUND OUTBOUND | | 3284 1628 | • | 1398 2908 |
| ENTRAINING LOADS: | ONDOGNE ONDOGED | | 824 232 | | 575 325 |
| PEAK HEADWWY | INBOUND OUTBOUND | | 3.0 | | 3.0 3.0 |
| CALCULATED TRAIN LO | | | | | |
| | END. CI HENDE | | -147202A.70 A.M. | | P.H. |
| | INBOUND | | 657 | | 280 |
| | OUTBOUND | | 326 | | 562 |
| (USE NOT | 13201 | | | | |
| PEAK ENTRAINING LOA | ID =[PEAK 15 MIN. | LOAI | | | |
| | · - | | A.M. | | F.M. |
| | INBOUND | | 460 | | 460 |
| | CUTBOUND | | 136 | | 260 |
| TOTAL OCCUPANT LOAD | €=CALCULATED TR | AIN | | | |
| | • | | A.M. | | F.M. |
| | UPPER PLATFORM | | | | 1580 |
| | LOWER FLATFORM | | 1980 | | 1750 |
| BENSITY CENET FLATS | ORM AREA / FEAK | ENTR | AINING LOAD | | |
| | | | A.M. | | P.M. |
| €HOT < 4 | SQ.FT. / PERSONI | UP | 9 51.08 | | 35.54 |
| | | LW | R 22.16 | | 31.79 |
| STATION OCCUPANT LO | AD (=LOWER + UPF | ER] | 3486 | | 3360 |
| TOTAL OCCUPANT LOAD | FOR CALCULATION | IS | 3486 | | |

Width Provided: Up.= 25.67 Lower= 55.00 [NOTCREDUIRGD]

SHT 2 OF 4 WVDYCAF.CE

STATION: WILSHIRE / VERMONT DATE: 6/21/89 BY: CAF

| EXIT | LANES | AND | CAPACITY | PROVIDED |
|------|-------|-----|----------|----------|
| EXII | LANES | טאא | LAPALIIT | PKOATAER |

| ELEMENT | DIRECTION | NUMBER | * LANES | × CAPACITY / LANE | = | PPM | | | | | | |
|-----------|-------------|-------------|-----------|----------------------|----|--------------|----------|--------------|-------------------------------------|--------|------|--------------|
| | atform to U | • | | | | | | atform to Co | | | | |
| Stairs | -up | 2 | 3 | 35 | = | 210 | Stairs | -ab | 2 | 3 | 35 | 210 |
| | -down | Û | 0 | 40 | = | 0 | | -down | 0 | 0 | 40 | 0 |
| Escalato | rs-up | 4 | 2 | 35 | 2 | 2 B 0 | Escalato | rs-up | 2 | 2 | 35 | 140 |
| | -d ฉพก | 0 | 0 | 40 | 2 | Ú | | -down | 0 | 0 | 40 | 0 |
| Eger. | -up | 4 | 4 | 35 | = | 560 - | Emer. | | 2 | 2 | 35 | 140 |
| Stairs | -down | 0 | Û | 40 | Ŧ. | 0 | Stairs | -down | . 0 | O | 40 | 0 |
| | | | 30 | Total | | 1950 | | | | 14 Tot | al | 490 |
| • | Fare Barrie | | | | | | - | Fare Barrier | | | | |
| Turnstil | | 4 | 1 | 25 | = | 100 | Turnstil | | 4 | 1 | 25 | 100 |
| Fare Gat | es | Q | 1 | 50 | = | Ù | Fare Sat | 25 | 0 | 1 | 50 | 0 |
| Service | Gates . | Û | 2 | 50 | = | v | Service | Gates | 0 | 2 | 50 | 0 |
| Emergenc | y Gates | 1 | 5 | 50 | = | 100 | Energenc | y ôates | 1 | 2 | 50 | 100 |
| | | | | Total | | 200 | | | | Tot | al | 200 |
| Fare Bar | riers to Sa | fe Area (So | uth) | | | | | riers to Saf | e Area (North) | | | |
| Stairs | -u p | 2 | 3 | 35 | I | 210 | Stairs | -ир | 2 | 3 | 35 | 210 |
| | -down | Q. | 0 | 40 | = | Ç | | -down | 0 | Û | 40 | 0 |
| calato | re-up * | 1 | 2 | 35 | = | 70 | Escalato | rs-up | 2 | 2 | 35 | 140 |
| | -фомп | Ù | ŷ | 40 | = | 0 | | -dэмл | 9 | 0 | 40 | 0 |
| Eger. | -75 | ý | 0 | 35 | Ŧ. | 0 | Ēaer. | -up | 0 | 0 | 35 | . 0 |
| Stairs | -домп | G | Ù | 40 | = | 0 | Stairs | лиос- | 0 | Ü | 40 | • |
| + Discou | nted | | | | | | | | | | | |
| | | | | Total | | 280 | | | | Tot | al | 350 |
| | | EMERGENCY | exit widi | TH TEST | | | | | FARE PARRIER TEST | | • | |
| Miniaua | Plationa Ex | ıt Width | | | | | | | Array | | cuth | Horta |
| - | | | | on x 50 Person | | | Capacity | | es and Turnstiles Total Capacity | | 100 | 169 50166 |

STATION: WILSHIRE /VERMONT

DATE: 6/21/89

BY: CAF

Test 1

WI(waiting time at platform exits) = Occupant Load / Exit Capacity

W1U = 1506 490 1 3.073 Minutes WIL = 1980 1 1050 1.886 Minutes Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T2 + T3 + T4 + T5 + T6

| | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| Ti (on lower platform) | 90 | 200 | | 0.450 |
| T2 (platform to platform)-up | 30 | 50 | | 0.500 |
| T3 (on upper platform) | 54 | .200 | | 0.270 |
| T4 (platform to concourse)-up | 19 | 50 | | 0.380 |
| T5 (on concourse to safe area) | 241 | 200 | | 1.205 |
| To (concourse to grade)-up | 40.5 | 50 | | 0.810 |
| | | | | |

3.715 **T** =

Minutes

Additional Waiting Time at Platform Exits

(W1L- T1)= 1.886 -0.450 =

1.436 Minutes

1.186

(W18-W1L)= 3.073 -1.686 =

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Occupant Load (Lower Flatform) - Lower Flatform Emergency Stair 4 Minute Capacity + Total Occupant Load (Upper Platform) - Upper Platform Emergency Stair 4 Minute Capacity

| 1980 | - (4 x | 560 |) • | 1568 | - (4 x | 140 | | 945 | Fatrons | | |
|------------|-----------|------------|--------------|--------|--------|---------|----------|---------|-------------|---------|-------|
| W2 = Conco | urse Octi | upant Lead | f / Gate Cap | pacity | | | <u> </u> | heck fo | r inbalance | ed Flow | |
| W2 = | 746 | 1 | 400 | = | 1.365 | dinutes | Herts: | 47.1 | 1 | 200 = | 2.261 |
| (W2 - W1)= | 2.365 | - | 3.073 | = | 0.000 | Minutes | South: | 473 | I | 200 = | 2.3:5 |
| Additional | | | | | | | | | | | |
| W3 = Conco | | | / Exit Cap | | | | | | | | |

W3 =

946 630 1.502 North: 473 1 350 = 1.351 Minutes (N3 - N1) = 1.689 -3.973 = 0.000 Minutes South: 473 . 280 = 1.539

Total Exit Time {=T+(W1-71)+(W1U-W1L)+(W2-W1)+(W3-W1)}

TOTAL = 5.338 MINUTES (NOT) 6 MINUTES)

STATION: WILSHIRE / VERMONT DATE:

6/21/89 BY:

CAF

*ECIAL CONSIDERATION - Lower Platform Occupants Use Emer. Stairs Only. Test 1

Evacuate Total Occupant Load from Platform in 4 minutes or less.

W18 =

1580

490

3,224 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Waiting Time at Platform Exits

(M1U-T3) = 3.224 -

0.270 =

2.954

Waiting Time at Fare Barrier -----

Occupant Load at Concourse = Total Occupant Load (upper) - Upper Platform Emergency Stair 4 Minute Capacity

1580 - 14 x 140) = 1020 Patrons North: W2U = 510 / 200 = 2.550 Minutes South: W2U = 510 7 200 = 2,550 Minutes

I - W10= 2.550 -

3.224 =

0.000 Minutes

Waiting Time at Concourse Exits

HIU = North: W3U = South:

510 / 510 350 = 280 = 1.457 1.821

Minutes Minutes

₩3U - ¥1U= 1.821 -

3.224 =

0.000 Minutes

Total Exit Time (=(T3+T4+T5+T6)+(N10-T3)+(N20-N10)+(N30-N10))

Upper Flatform

Total = 5.619 Minutes (Not) 6 Minutes)

Total Exit Time Lower Platform

(=Occupant Load / Emer. Stair Capacity)

Total = 1980

560

3.536 Minutes

RECLIVED

MAR 5.5 1989

March 14, 1989

FEDERAL EXPRESSIC.

RECEIVED BY, MRTC

MAR 16 1989

SAFETY & ASSURANCE

Mr. Malcolm Ingram Metro Rail Transit Consultants 548 South Spring Street, 7th Floor Los Angeles, CA 90013

PRELIMINARY EXIT CALCULATIONS

Malcolm:

Copies of preliminary exit calculations for Hollywood/Highland and Hollywood/Vine are enclosed. As we discussed, the Wilshire/Alvarado Station Configuration was used.

Each station will have the following circulation elements:

Platform to Mezzanine

- 2 3-unit emergency stairs
- 2 3-unit normal stairs
- 2 2-unit escalators

Mezzanine to Grade

- 2 3-unit normal stairs
- 2 2-unit escalators

These calculations will be updated as the preliminary plans become available. If you have a question, please call.

Sincerely,

David R. Fiedler, P.E.

DRF: jmp - H3275.01

Enclosure

| STATION: Hollywoo | od/Vine DATE: 3 NET PLATFORM AREA = | | BY: Dif |
|--|--|---|--|
| OCCUPANT LOAD CALC | | DESIG | N YR |
| PEAK HOUR | - | A.H. | ۴,۶ |
| EINK LOADS: | | 5469 | 1527 |
| | 001800%0 | 2255 | 4477 |
| ENTRAINING LOADS: | | 718 . | 7 97 |
| | ONTROUND | 148 | 324 |
| PEAK 15 MINUTE LOA | ADS [=PEAK HR. LOAD x 1. | 15 41 | |
| LINK LOADS: | TN90UN5 | 1573 | 44) |
| | OUTBOUND | 549 | 1238 |
| ENTRAINING LOADS: | CHEGUNO | 207 | 230 |
| | OUTBOUND | 43 | 94 |
| HEADWAYS: | INFOUND | 6.0 | 6.0 |
| | OUTBOUND | 6.0 | 6.0 |
| | .040 (=PEAK 15 MIN, LINK ING. OF HEADWAYS =1 | | / FEADWAY): |
| | | NTEGER(15 MIN. A.Y. 787 | |
| | [NG. OF HEADWAYS =[| NTEGER (15 MIN. A.Y. | / FEADWAY): M.q |
| | (NG, OF HEAGWAYS =1 INBCUND OUTAGEND TGTAL | A.Y. 797 325 1112 | 7 FEADWAY): P.M 220 644 364 |
| | (NG, OF HEAGWAYS = 1 INBCUND OUTAGUND | A.Y. 797 325 1112 | 7 FEADWAY): P.M 220 644 864 |
| | (NG, OF HEAGWAYS =1 INBCUND OUTAGEND TGTAL | A.Y. 787 325 1112 1320 x (4 x HEADWAY | / MEADWAY): P.M 220 644 864 1020 / 15 MIN.): |
| | (NG. OF HEAGWAYS =: INBOUND OUTBOUND TOTAL USE (NOT < 13201 NAS =(FEAK 15 MIN. LOAD | A.Y. 787 325 1112 1320 X (4 % HEADWAY A.M. | 7 MEADWAY): P.M 220 644 864 (000 7 15 MIN.): F.M |
| | TARCUND OUTROUND TOTAL USE ENDT < 13201 | A.Y. 787 325 1112 1320 x (4 x HEADWAY | / MEADWAY): P.M 220 644 864 1020 / 15 MIN.): |
| | (NG. OF HEAGNAYS =: INBOUND OUTBOUND TOTAL USE (NOT < 13201 NAD =(FEAK 15 MIN. LOAD INEGONO | A.Y. A.Y. 797 325 1:12 1:20 x (4 × READWAY A.Y. 3:0 | 7 FEADWAY): P.M 220 644 864 (330 7 15 MIN.): F.M 344 |
| PEAK ENTRAINING LO | INBOUND OUTBOUND TOTAL USE CNOT < 10201 DAD = CREAK IS MIN. LOAD INFOUND COUTSOUND | NYEGER (15 MIN. A.Y. 787 325 1:12 1:320 x (4 × HEADWAY A.H. 3:0 64 | 7 FEADWAY): P.M 220 644 864 (CCC) 7 15 MIN.): F.M 244 |
| PEAK ENTRAINING LO | (NG. OF HEAGNAYS =: INBOUND OUTSOUND TOTAL USE (NOT < 13201 DAS =(FEAK 15 MIN. LOAD INEGUND CLISCUND | NYEGER (15 MIN. A.Y. 787 325 1:12 1:320 x (4 × HEADWAY A.H. 3:0 64 | 7 FEADWAY): P.M 220 644 864 (CCC) 7 15 MIN.): F.M 244 |
| PEAK ENTRAINING LO | INBOUND OUTBOUND TOTAL USE CNOT < 10201 DAD = CREAK IS MIN. LOAD INFOUND COUTSOUND | A.Y. 797 325 1112 1320 x (4 % HEADWAY 4. N. 110 54 374 NING LOAD) A.M. | 7 MEADWAY): P.M 220 644 864 (320 7 15 M(N.): F.M 344 140 |
| PEAK ENTRAINING LO | INBOUND TOTAL USE ENOT < 13201 AND = CREAK 15 MIN. LOAD INEGUND TOTAL FORM AREA / PEAK ENTRAT | A.Y. 797 325 1:12 1:20 x (4 × READWAY 4, N. 5:0 54 374 NING LOADI A.M. 51:10 | 7 FEADWAY): P.M 220 644 864 (320 7 15 MIN.): F.M 244 24,03 |
| PEAK ENTRAINING LO | INBOUND TOTAL USE (NOT < 13201 AND =(FEAK 15 MIN. LOAD INECOND CO.TSOUND TOTAL FORM AREA / PEAK ENTRAI SO.FT. / PERSON) | A.Y. 797 325 1:12 1:20 x (4 × READWAY 4, N. 5:0 54 374 NING LOADI A.M. 51:10 | 7 FEADWAY) 1 P.M 220 644 864 (320 7 15 MIN.) 1 F.M 344 140 48: P.M 24,03 |
| PEAK ENTRAINING LO SENSITY (=NET PLAT TOTAL GCCUPANT LOA | INBOUND TOTAL USE (NOT < 13201 AND =(FEAK 15 MIN. LOAD INECOND CO.TSOUND TOTAL FORM AREA / PEAK ENTRAI SO.FT. / PERSON) | NTEGER (15 MIN. A.Y. 797 325 1:12 1:20 x (4 x READWAY A.Y. 3:0 54 374 NING LOAD) A.M. 31:10 AD + PEAK ENTRA | 7 FEADWAY): P.M 220 644 864 (320 7 15 MIN.): F.M 244 24,03 |
| PEAK ENTRAINING LO TAJE TEME) VIICASC TOWN AO TOWN TO SEE TOWN TO | INSCUND INSCUND OUTSGUND TOTAL USE ENOT < 10201 DAS = CREAK IS MIN. LOAD INFOCKS CLISCOND TOTAL FORM AREA / PEAK ENTRAI SO.FT. / PERSON) O C=CALCULATED TRAIN LO | NTEGER (15 MIN. A.Y. 797 325 1:12 1320 x (4 % HEADWAY 4. M. 3:0 54 374 NING LOAD! A.M. 31.10 A.M. 31.10 A.M. 4.M. 16.24 | 7 FEADWAY) 1 P.M 220 644 864 1720 7 15 XIN.) 1 F.M 244 140 481 24.03 |

¥1 =

1804

56)

3.221 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route ------

T = T1 + T2 + T3 + T4 + T5

| | | Feet | FFH | = | Minutes |
|----|----------------------------|------|-----|-----|---------|
| 11 | (platform) | 124 | 260 | | 6.620 |
| 72 | (platform to concourse)-up | 15.5 | 50 | | 0.530 |
| 13 | (an canceurse) | 251 | 200 | | 1.305 |
| 74 | (concourse to grade)-up | 18.5 | 50 | | 0.370 |
| 15 | (grade) | ij | 200 | | 0,000 |
| | | | | 7 = | 2,625 |

Additional Waiting Time at Platform Exits

(W1 - F:) = 3.221 - 0.620 =

2.601 dinutes

Additional Waiting Fine at Fare Barrier

Occupant Load at Concourse = Total Occupant Load - Emergency Stair 4 Minute Capacity

| :304 | - (4 x | 210 | ; = | 754 | Patrons | | CHECK FOR | UN8ALANCE! | ALANCED FLOW | |
|-----------|-------------|-----------|---------------|--------|----------------|---------|---------------|-------------|--------------|--|
| | | | | | | | éccay | East | #est | |
| 42 = Cano | course úcc: | apant Loa | nd / Gate Car | oac:tv | | | Patrons | 653 | 302 | |
| W2 = | 954 | 7 | 550 | = | 1.483 | Minutes | Capacity | 45 0 | 200 | |
| (02 - 91) |)= 1.510 | - | 3.321 | = | ថ្ងៃ ភ្នំពីថ្ង | Minutes | 7€ 有 度 | 1.473 | 1.510 | |

Additional Waiting Time at Concourse Exits -----

WD = Compourse Occupant Load / Epit Capacity

47 = 384 / / · 180 = 5.443 Minotes 800 - Wi = 0.440 5.221 = 0.321 Minutas

Total Exit Time [=T+(W.-Ti)+(W2-W1)+(W3-W1)]

TOTAL = 5.448 MINUTES [NOT > 6 MINUTES]

ETATION: Abilivaccoverne DATE: 3/14/69 st: Dec

ECIT LAMES AND CAPACITY PROVIDED

| ELEMENT | DIRECTIO | IN NUMBER | x LANES | x CAPACITY / LANE | · = | 998 | | | |
|----------|------------|--------------------------|------------------|-------------------|-------------|------------------|------------|----------|------------|
| | to Concou | | | | | | | | |
| Stairs | | 2.; | 3 | 35 | = | 210 | | | |
| | -down | 0 | 0 | 40 | = | ŷ | | | |
| Escalato | rs-up | 2 | 2 | 75 | = | 140 | | | scounted |
| | -down | ij | 0 | 40 | = | ů | | | |
| Saer. | -42 | 2 | 3 | 35 | = | 210 | | | |
| Stairs | -down | Ç | 0 | 40 | = | ø | | | |
| | | | ī á | Total | | 560 | | | |
| Through | Fare Barri | ers | | . 5.5. | | 201 | East | West | |
| Turnstil | P5 | 10 | * | 25 | = | 250 | . 6 | 4 | • |
| Fare Gat | _ | Ů | i | | = | ð | Ô | Ò | • |
| Service | | 1 | 2 | | = | 100 | 1 | 1) | |
| | y Gates | 3 | 2 | 5) | = | 300 | 2. | 1 | |
| , | | | | | | | | | |
| | | | | Total | | 350 | | | |
| Fare Bar | riers to S | afe Area | | | | | | | - |
| Stairs | -up | 2 | * | 35 | = | 210 | • | | |
| | -домл | Ú | Ú | 40 | 2 | ä | | | • |
| Escalato | rs-up f | 1 | 2 | . 35 | 2 | 70 | ¥ - one es | calator. | discounted |
| | -cown | Ð | ij | 4.0 | = | ı) | | | |
| Ezer. | -ир |) | ä | 35 | = | Ù | | | |
| Stairs | -dawa | .ī | ý | 40 | = | ý | | | |
| | | • | | | | | | • | |
| | , | | | Total | | 250 | | | |
| | | FARE BARRO | ER TEST | | | | | | |
| | | | - - | | | | | | |
| Cararit | el Sign G | ates and Tur | árnav Hattins | Bast 190 | ¥est 160 | PFM | • | | |
| Lapacity | | 40 0 5 540 25 | | | | 700 1414 5381 | | | |

ERERGENCY EXIT WIDTH TEST

Parcant of Total Tagacity 37.35 50.00 (MGf.50%)

Missaum Platform Exit Width

laMet Platform Area /175q.Ft. per Person x 50 Persons per Ft.//

Minimum Width Required = 33.24

Widta Próvided = 29.33 (NOT < REQUIRED)

CHERGENOM BALT CAPIBLITY TERMS SHOULDED SHOULD BE

._____ 8418: 3/14/39 8): CRF STATEON: Hollywood/Vige řest .

| STATION: Hallywago | //Highland DATE NET PLATFORM AREA | | BY: ORF |
|-----------------------------------|--|------------------------|----------------|
| OCCUPANT LOAD CALCU | ILATION | | ESIGN /R |
| FEAK HOUR | | A.a. | F. N. |
| LINK LOADS: | INBOUND | 5674 | 1228 |
| | OUTBOUND | 1546 | 4115 |
| ENTRAINING LOADS: | INBOUND - | 854 | 614 |
| | OUTBOUND | 263 | 761 |
| PEAK 15 MINUTE LOAD | S (=PEAX HR. LOAD x | 1.15 / 41 | |
| EINK LOADS: | | 1633 | 354 |
| | OUT90JND . | 445 | 1184 |
| ENTRAINING LOADS: | | . 255 | 177 |
| | OUT50UND | 7 a | 219 |
| HEADWAYS: | INECAND | á.)) | ٤.0 |
| | DUTBOUND | 5.0 | 5.0 |
| | AD E=PEAR IS MIN. EI END. OF HEADWAYS | | |
| | | y.4. | |
| | INBOUNG CUTBOUND | 817 723 | 177 552 |
| | 00138888 | 445 | 972 |
| | TOTAL | 1042 | |
| | USE 1907 - 13201 | i 320 | 1720 |
| PEAK ENTRAINING LIA | D =EFEAK 15 MEN. LOA | D = (4 < BEADM A.M. | |
| | - Inegune | a.n. 381 | |
| | OL (BOUNG | 114 | 303 |
| - | TGTAL | 475 | 373 |
| DENSITY (=NET PLATF) | ORM AREA / PEAK ENTR | AINING LOADI A.H. | 0 4 |
| ENDT € 4 S | 00.FT. / PERSON) | 23.50 | 19.51 |
| TOTAL OCCUPANT LGAD | f=CALCHLATED TRAIN | (848 + FF3K FN | TRAINING (BAG) |
| | 1 | 4.6. | f.M. |
| Lance of | TOTAL | 1815 | 1913 |
| Lesser of AREA/A or Entraining | ı Egad + Traın Epad | 1315 | 1913 |
| TOTAL DECUFANT LOAD | | | - /. |

SHT 2 DF 3

STATION: Hollywood/Highland DATE: 3/14/89 BY: DRF

| EXIT LANES AND | CAPACITY | PROVIDED |
|----------------|----------|----------|
|----------------|----------|----------|

| ELEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | = | PPM | | | |
|-----------|----------------|--------|---------|----------------------|-----|-------------|------------|-----------|------------|
| | to Concours | | | | | | | | |
| Stairs | | 2 | 3 | 35 | = | 210 | | | |
| | -down | Û | Ü. | 40 | = | 0 | | | |
| Escalato | rs-up | 2 | 2 | 35 | = | 140 | | | scounted |
| | -cawn | Û | 0 | 4.) | = | Û | | | |
| Eaer. | -up | 2 | 7 | 75 | . = | 210 | | | |
| Stairs | -down | ij | ù | 40 | = | 6 | | | |
| | | | | | | | | | |
| | | | lá | Fotal | | 560 | | | |
| Through . | Fare Barriers | i | | | | | East | West | |
| Turnstil | es | 10 | 1 | 25 | = | 250 | á | į | |
| Fare Gat | es | Û | 1 | 50 | = | Ü | ń | Ű | |
| Service i | ĝat e s | 1 | 2 | 50 | = | 190 | 1 | 0 | |
| Emergenc | y Gates | 3 | 2 | 50 | = | 300 | 2 | 1 | |
| | | | | | | | | | |
| | | | | Total | | 5 50 | | | |
| | riers to Safe | | | | | | | | |
| Stairs | | 2 | - | 35 | = | 310 | | | |
| | -dawn | Ç | ý | 40 | = | Ų | | | |
| Escalato: | rs-up • | 1 | 2 | 35 | = | 70 | i - gas es | calator : | discounted |
| | -daen | ý | ·γ | 40 | = | ŷ | | | |
| £aar. | -up | Ĉ | i. | 75 | = • | Ú | | | |
| Etairs | -down | .} | d) | 41) | = | 0 | | | |
| | | | | | | | | | |
| | | | | atai | | 28.0 | | | |

FARE BARRIER TEST

Array East West
Capabity of Fare Gates and Turnstiles 150 100 FFM
Percent of Total Capabity 33,33 50,00 (NCT)50%)

EMERGENCY EXIT WIDTH TEST

Minimum Flatform Exit Width

Cadet Stationa Area / (73q.Ft. per Ferson : 50 Persons per Ft.)]

Micinum Width Required = 30.24

Wiste Provided = 29.30 (897 GEOUINES)

STATION: Hollywood/Kighland

DATE: 3/14/89 97:

ORF

Tast 1

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Will(waiting time at platform exits) = Occupancy Load / Exit Capacity

ij! ≡ 1913 / 550 5.416 Minutes

> Test 2 ----

· Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T2 + T3 + T4 + T5

| | Fe∋t | / JEM | = | Minutes |
|-------------------------------|-------------|-------|------------|---------|
| Ti (platform) | 124 | 500 | | 0.870 |
| T2 (platform to contourse)-up | 16.5 | 50 | | 0.330 |
| 13 (an concourse) | 7 61 | 200 | | 1.305 |
| TA (concourse to grade)-up | 18.5 | 50 | | ð.376 |
| (grade) | Û | 200 | | 0.000 |
| | | | | |
| | | | 7 = | 2,625 |

Additional Waiting Time at Platform Exits

(Wi - Ti)= 3.416 -9.420 = 2.796 Minutes

Additional Waiting Time at Fare Parrier

Occupant Load at Concourse = Total Occupant Load - Emergency Stair 4 Mirute Capacity

| 1913. | - ,4 ; | Ιώ | , = | 1670 | fatrona | | CHECK FIS | 胡鹃山湖田 | FLEW |
|---------------------|--------------------|---------------------------|-------------|--------|---------|-----------|-----------|-------|-------|
| | | | | | | | Arra | East | Wast |
| 42 = lenco (| urse C c cu | ipant Lo <mark>a</mark> d | / Gate Cap | pacity | | | Patross | 73 a | 316 |
| #2 = | 1073 | 1 | 65 0 | = | 1.651 | ដីដែលប្រទ | Capacity | 450 | 199 |
| (22 - W1)≈ | 1.680 | - | 3.416 | = | 0.006 | Minutes | lise | 1,540 | 1.586 |

Additional Maiting Time at Concourse Exits

WI = Concourse Occupant Load / Exit Capacity

 $W_{2}^{*} = 1075$ 260 ≈ F.871 Minutes 1 (MS - MI)= 0.331 -3.415 = 0.416 Athetes

Total Exit Time [=5*(W1-T1)*(W2-W10+(W3-W10))

TOTAL = 5.807 MINUTES [NOT > 5 MINUTES]

| STATION: Hollywoo | d/Vine DATE: NET PLATFORM AREA = | | ay: Torr |
|---------------------|---|----------------------|--------------------------|
| OCCUPANT LOAD CALC | ULATION | | CESIGN YR |
| FEAK HOUR | | A.3. | ۶.۲. |
| LINK LOADS: | | 5469 | 1527 |
| | JUTECUNO | 22 55 | 4477 |
| ENTRAINING LEADS: | 1486UND Cutrgund | 718 148 | 797 324 |
| | | • | 327 |
| | OS C=FEAK HR. LOAD X | 1.15 / 41 | |
| LINK LOADS: | INBOUND | .573 | 440 |
| • | ONUOSTUC | 547 | 1798 |
| ENTRAINING LEADS: | • | 207 | 270 |
| · | OUTROUND | 43 | 74 |
| HEAGNAYS: | IMBOBND | 6.0 | 6.0 |
| | 30736UNE | 6.0 | · 6.0 |
| | DAD (=FEAP 15 KIN. LI IND. DE HEADWAYS | =INFESER(15 H.X. | MIN. / HEADWAYII F.M. |
| | CAU18F1 | 757 | 220 |
| | ีน ีร อย ทว ์ | 325 | . ह्युद |
| | न्यानू. | 1117 | |
| | USE 1907 1 130A1 | 1310 | 1020 |
| FEAR ENTRACMENC LT | 4) =1924k :5 fin. USA | 0 v (4 v 16) 4.#. | |
| | [MEG., M5 | 71.5 | |
| | 66,36642 | ÷4 | |
| | TOTAL | 774 | 41, |
| TERRITY CONET PLATE | FOFM AREA / PEAK ENTR | AINING LOAD: | |
| | | A.¥. | 7.M. |
| ENCT < 4 | BO.FT. / FERSON: | 31.16 | 23,00 |
| COMAL GOODFANT LOAD |) (=CALCULATED TRAIN | | |
| | - 107.4 | A. 31. | F.V. 1814 |
| Lasser of | TOTAL | 1574 | 1014 |
| ASIA/4 or Estraieur | og Clad + Train Load | 1574 | 1604 |
| TOTAL DICEPART COAR |) FOR CAUCULATIONS (| 3: | |
| • | | | |

V1 =

1804 /

490

3.682 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T2 + T3 + T4 + T5

| | Feat | i FPM | = | Minutes |
|-------------------------------|------|-------|-----|---------|
| <pre>71 (platform)</pre> | 124 | 200 | | 0.520 |
| T2 (platform to concourse)-up | 16.5 | 50 | | 0.330 |
| T3 (on concourse) | 261 | 206 | | 1.305 |
| T4 (concourse to grade)-up | 18.5 | 50 | | 0.270 |
| 15 (grade) | Q | 200 | | 0.000 |
| | | | | |
| | | | T = | 2.625 |

Additional Naiting Time at Flatform Exits

(M1 - T1)= 3.682 -

0.620 =

3.062 Minutes

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Total Ecoupant Load - Emergency Stair 4 Minute Capacity

| 1804 | - (4 x | 210) = | 764 | Patrons | | SHECK FOR | UNBALANCES | FLOW |
|----------|--------------|--------------------|----------|---------|---------|-----------|------------|-------|
| | | | | | | Array | East | ¥est |
| ₩2 = Can | course Boout | oant Load / Gate (| Dapacity | | | Fatrons | 620 | 345 |
| ¥2 = | 764 | / 850 | · = | 1.483 | Minutes | Ispacity | 450 | 2(a) |
| (82 - 81 | 1= 1.725 | - 3,583 | 2 = | 0.000 | Hinutes | Time | 1.378 | 1.725 |

Additional Waiting Time at Concourse Exits

MD = Concourse Cocupant Load / Exit Capacity

\(\alpha\) = \quad \(\gamma\) \quad \(\frac{350}{350}\) = \quad \(2.754\) \quad \(\frac{\pi}{2.754}\) \quad \(\frac{\pi}{2.754}\) = \quad \(0.900\) \quad \(\frac{\pi}{2.754}\) = \quad \qua

Total Exit Time [=T+(W1-T1)+(W2-W1)+(W3-W1))

TOTAL = 5.687 MINUTES [NOT > 6 MINUTES]

| | Vermont DATE: | | BY: DRF |
|------------------------------------|---|--------------------------|----------------|
| OCCUPANT LOAD CALC | NET PLATFORM AREA : JLATION | : 11602 DES | IGN YR |
| | | | |
| PEAR HOUR | • | A.M. | F.d. |
| CINN LOADS: | INBOUND | 6 316 | 2112 |
| | OUTBOUND | 2996 | 4906 |
| ENTRAINING LOADS: | INBOUND | 719 | 798 |
| | OUTBOUND | 279 | 287 |
| PEAK IS MINUTE LOAD | OS CEPEAN HR. LOAD x | 1.15 / 4} | |
| CINK LOADS: | TNSAUND | 1816 | รู่บ์สิ |
| CIMA EGREOI | DUTBEUND | 601 | 1411 |
| | | | |
| ENTRAINING LOADS: | | 2-97 | . 114 |
| | OUTBOUND | 91 | 92 |
| HEADWAYS: | INBOUND | 5. V | 6. 0 |
| | GUTBGUND | 5.0 | . 5.9 |
| | DAD (=REAK 15 MIN. LI ING. OF HEADWAYS | | . / HEADWAY)] |
| | INBOURD | 90 8 | 364 |
| | OUTEDUNG | . 701 | 705 |
| | TOTAL | 1207 | 1010 |
| | USE CVO7 < 13203 | | 1520 |
| SEAL ENTRACHENO LOS | ar irraa ir uru i aa | O / S - (F170// | 9 / 15 MTL 17 |
| rear en Malmino Lor | 16 =638Ab 15 MIN. LJA | H#U=3M 2 P3 V U: A,A. | |
| | 196908D | 510 | 7.8. 171 |
| | Butrolnu | :21 | 174 |
| | 1914L | 45: | 276 |
| DENETTY CONET PLATE | FORM AREA / PEAK ENTA | | |
| INOT A J | ca et / rencomb | 8.H. | 8.8. 39.43 |
| ANGLES 4 | SQ.FT. / FERSON) | 20.17 | ⊕7• # 3 |
| TOTAL GETUPANT LOAD | E=CALCULATED TRAIN | | |
| | - | A.M. | 2. 1 1. |
| laces of | TOTAL | 1751 | :415 |
| Lasser of - 5425/4 or Patroinse | ng Ibad + Train Load | 1 == 1 | 1513 |
| - TOTAL BECUPANT LOAS | | :751 | 1313 |
| Taric saverine Edmi | i in anesaga)tema | | |

EMERGENCY EXIT CAPACITY

SHT 2 0F 3

STATION: Sunset / Vermont DATE: 3/17/89 SY: DAF

EXIT LANES AND CAPACITY PROVIDED

| | DIRECTION to Concourse | NUMBER e | x LANES | x CAPACITY / LANE | = | 2F.M | | | |
|-----------|------------------------|-------------|---------|----------------------|------|-------------|---------|-----------|------------|
| | | | | | | • | | | |
| Stairs | • | 2 | 3 | 35 | | 210 | | | |
| | -down | ó | tj | 40 | | Ú | | | |
| Escalator | • | : | 2 | 22 | = | 76 | ¥ - one | escalator | discounted |
| • | -Cown | û | Ġ | 40 | = |) | | | |
| Emer. | -n b | 7 | 3 | 35 | = | 210 | | | |
| Stairs | -down | ύ | 0 | 46 | = | ô | | | • |
| | | | | | | | | | |
| Tanadah S | S | _ | 14 | Total | | 495 | F | W==4 | |
| iarough i | are Barriers | - | | | | | tast | . West | |
| Turastila | 25 | 10 | i | 25 | 3 | 250 | خ | 1 | |
| Fare Gate | 95 | û | 1 | | = | ý | ij | Ů | |
| Service (| | 1 | 2 | 50 | = | 150 | i | Ĵ | |
| • | y Gates | 3 | 2 | | = | 360 | 2 | 1 | |
| | | | | | | | | • | |
| | | | | Total | | 65 0 | | | |
| Fare Barr | riers to Safe | e Area | | | | | | | |
| | | | _ | | | | | | |
| Stairs | -up | 2 | 3 | | = | 219 | | | |
| | -down | j |) | 40 | = | i. | | | |
| Escalator | | 2 | r: | | = | 140 | | | |
| _ | -down | 9 | ij | 4. <u>)</u> | = | tì | | | |
| Exer. | F | j j | Ů | | 3 | 0 | | | |
| ∃tairs | -dewr | ŷ. |) | 46 | ٤ | į. | | | |
| | | | | Total | | 750 | | | |
| | | | | | | | | | |
| | : | FARE BARE! | ER TEST | | | | | | |
| | - | | Array | East | West | | | | |
| Fingnity | of Fare Gate | | | | | pan | | | |
| | fercent of | | | | | INSTESSA: | | | |

EMERSENCY EXIT WIDTH TEST

Minimum Platform Exit Wigth

levet Platform Area /175q.Ft. per Person + 50 Persons per Ft.))

dinimum Width Required = 33.24

Width Frovided =

25.67 (NOT 1 REQUIRED)

ENERGENCY EXIT CAPICITY TESTS

581 J OF J

STATION: Sunset / Verwont

DATE: 3/17/87

ORF BY:

Test i

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Will(waiting time at platform exits) = Occupancy Load / Exit Capacity

W1 = 1751 / 490 .=

3,573 Minutes

Test 2

Evacuate Total Occupant load from the most remote point on the platform to a point of safety in & minutes or less.

Walking Time for longest exit route

7 = 51 + 72 + 73 + 74 + 75

| 1 - 11 + 12 + 19 + 14 + 19 | Feet | / FPM | = | Minutes |
|--------------------------------|------|-------|---|---------|
| 71 (platform) | 12; | 200 | | 0.620 |
| T2 (platform to concourse) -up | 15.5 | 50 | | 0.330 |
| T3 van conceurse) | 251 | Z(66 | | 1.305 |
| 74 (concourse to grade)-up | 19.5 | 50 | | 0.370 |
| 35 (grade) | ú | 200 | | 0,000 |
| | | | | |
| | | | - | |

Ţ = 2.525

Additional Waiting Time at Planform Exits

(M1 - 71)= 3.575 -0.626 =

2,950 Minutes

Additional Waiting Time at Fare Barrier

Podupant Load at Concourse = Total Decupant Load - Emergency Stair 4 Minute Catacity

| 1751 - | · 14 : | 210 | 1 = | 71: | Fatrons | | EnEE,1 434 | UNSALANCED | r COW |
|-------------|------------|-----------|------------|-------|-------------------|---------|------------|------------|-------------|
| | | | | | | | ÁFFBV | East | 4est |
| W2 = Conces | irse Occus | oant Load | / Gate Cap | acity | | | Satrons | 586 | 33 <u>6</u> |
| W2 = | 711 | 1 | 550 | = | 1,402 | Minutes | Сарастту | 450 | 200 |
| (42 - W()= | 1.650 | - | 3,573 | 2 | $(0, \lambda(0))$ | Minutes | Ī:¶e | 1.307 | 1.:30 |

Additional Waiting Time at Concourse Exits

WT = Eshecurse Occupant Load / Exit Capacity

W3 = 311 / 350 = 1.507 Minutes 3.573 = 183 - 8D= 2.683 - - -0.000 Minutes

Intal Exit Time (="f+(WI-F1) + (WZ-W1) + (WZ-W1))

1074. = 5.573 MEMBYES TWOY & MEMETERS!

| - STATION: Vermont | / Beverly DATE NET PLATFORM AREA | | |
|---------------------|--|----------------|--------------------------|
| DECUPANT LOAD EALC | ULATION | | DEGIGN YR |
| PEAK HOUR | | A.M. | P.M. |
| LINK LOADS: | | 9057 | 2678 |
| | OUTECOND | 2217 | 5746 |
| ENTRAINING LOADS: | · · · · | 754 | 32: |
| | CAUDETUG | 300 | 401 |
| PEAK 15 MINUTE LCA | DS [=PEAK HR. LGAD x | 1.15 / 4] | |
| LINK LOADS: | | 3317 | 775 |
| | OUTBOUND | 538 | 1652 |
| ENTRAINING LOADS: | CMUOBNI | 275 | 93 |
| | GUTESUND | 87 | 116 |
| HEADWAYS: | | à.Ú | 5.0 |
| | OUTBOUND | 5. 9 | 6.0 |
| | DAD C=PEAK 15 MIN. L (NG. OF HEADWAYS | | |
| | LNO. OF BEHOWAYS | =1N186EM115 | 11N. / MEAUNAT)) P.M. |
| | iagound | 1159 | |
| | OSTBOUND | 219 | 80 <i>6</i> |
| | TOTAL | :478 | 1214 |
| | JSE (NQT < 1326) | : 478 | 1020 |
| FEAR ENTRAINING LOA | 40 =CFEAK .S niN. 201 | AD x (4 x HEA) | |
| | · - | ន.ឥ. | |
| | INBOUND | 411 | |
| | 0MF 381 no | 130 | .73 |
| · | Tarki Carbo | 541 | 312 |
| DEMBILY CONET PLATE | ORM AREA / PEAK ENTR | RAINING LOADS | |
| | | A.M. | F. H. |
| [NGT ← 4 | SØ.FT. / PERSON] | 21.50 | 37.28 |
| TOTAL OCCUPANT LOAD | [=CALCULATED TRAIN | | _ |
| | T374: | A.X. | ያ. ለ . |
| Lesser of | TOTAL . | 2019 | 1602 |
| = = | g Load + Frain Load | 1017 | 1632 |
| TOTAL GOODFANT LOAD | | 2019 | |

| ELEMENT | DIRECTION | NUMBER | x LANES | × CAPACITY / LANE | = | PPM | | | |
|-----------|---------------|--------|---------|----------------------|------------|--------------|------------|-----------|------------|
| Platfors | to Concours | e | | | | | | | |
| Stairs | | - 2 | 3 | 35 | = | 210 | | | |
| 0.011.3 | -down | | ý | 40 | | 6 | | | |
| Escalato | r5-up | 2 | 2 | 75 | | 140 | | | scounted |
| | -comu | i | | | = | 0 | | | 300011260 |
| Emer. | -115 | | į. | 35 | | 280 | | | |
| | -down | ů | , Ú | A û | = | 6 | | | |
| 36411.5 | 20#11 | ٧ | . " | | - | | | | |
| | | | . 13 | Int=1 | | 630 | | | |
| Through i | Fare Barrier: | 5 | | 10.44 | | 470 | East | West | |
| | | - | | | • | | | | |
| Turnstil: | es . | ; 0 | 1 | 25 | | 250 | | 4 | |
| Fare Gate | e s | i) | 1. | 50 | = | Ü | 3 | ŷ | |
| Service : | Sates | 1 | 2 2 | 50 | = | 100 | 1 | Û | |
| Emergenc | y Gates | 3 | 2 | 50 | ÷ ′ | 300 | 2 | t | |
| | | | | Total | | 650 | | | |
| | riens to Safe | | | | | | | | |
| Stairs | | 2 | 5 | 75 | = . | 210 | | | |
| | -dawa | ú | Ú | 4.5 | = | ij | | | |
| Escalator | r5-up ≠ | 1 | | 75 | | 70 | é - one es | calator o | itscounted |
| | -dawa | | | 46 | = | 5 | | | |
| Eaer. | -up | | Û | 55 | | ġ. | | | |
| | торна | | ΰ | 45 | = | ó | | | |
| | | | | Total | | 7 <u>8</u> 6 | | | |

PARE BARRIER TEST

Array East West
Capacity of Fare Gates and Turnstiles 150 100 FPM
Percent of Total Capacity 33.37 50.00 1887/50%)

EMERGENCY EXIT WIDTH TEST

fininum Flatform Exit Width

CaMet Platform Area /178q.Pt. per Person v 50 Parasons per Pt. 1

Minimum Wigth Sequired = 33.24

Width Ersylded = 03.00 (801 1 RECUIRED)

1

EMERGENCY EXIT CAPICITY TESTS

SHT 3 OF 3

VERBEVOI.CE

STATION: Versont / Beverly

DATE: 3/16/89

1/89 9Y: DRF

Test 1

Evacuate Total Occupant Load from Platform(s) in 4 ginutes or less.

Wi(waiting time at platform exits) = Occupancy Load / Exit Capacity

W1 = 2019

630 =

5.205 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = 71 + 72 + 73 + 74 + 75

| | • | Feet | /, EPH | = | Minutes |
|----|----------------------------|------|--------|---|---------|
| 11 | (platform) | 124 | 200 | | 0.520 |
| 12 | (platform to concourse)-up | 16.5 | 50 | | 0.330 |
| 13 | (an concourse) | 261 | 200 | | 1.305 |
| 14 | (concourse to grade)-up | 18.5 | 50 | | 3.370 |
| 75 | (grade) | ij | 200 | | 0.000 |
| | | | | | |

7 = 2.625

Acditional Waiting Time at Flatform Exits

(W1 - T1)= 0.205 -

0.50 =

2.585 Minutes

Additional Wasting Time at Fame Berrier

Occupant Load at Concourse = Total Recupant Load - Emergency Stair 4 Minute Capacity

| 1017 | - :4 x | 250 |) = |) = 349 | | | CHECK FIR CHREALANCED FLOW | | |
|----------|--------------|-----------|------------|---------|-------|----------|----------------------------|----------|-------|
| | | | | | | | ACTEV | East | 3541 |
| #2 = Eco | course Occup | pant Load | / Gate Cap | acity | | | Patrons | <u> </u> | 761 |
| W2 = | 399 | 1 | ه 50 | = | 1.383 | Provies. | 44785111 | 25) | 2); |
| WZ - WI. | = 1,405 | - | 3.205 | = |), a. | dister | ែក€ | 1. 175 | 2.405 |

Additional Waiting Time at Concourse Exits

| 14 T | = Cancourse | Secusiani | lean i | / Funt | Canacity |
|------|-------------|--|--------|--------|---------------|
| 4.7 | untermit 25 | 0.1.1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2. | L 40 / | EXIL | U a U dilli i |

| #3 - 19HC00 | 4 20 0000 | 9 3 17 C | can i Evic cabacica | | |
|-------------|-----------|----------|---------------------|-------|---------|
| 43 = | 855 | 1 | 7 8 0 = | 7,211 | Mirytes |
| .35 - Wille | 3.111 | - | 7.20 5 = | 0.005 | hitmtes |

Total East Time : {=T+ W1+T00+7W2-W1 -4WT-W10}

TATAL = 3.216 MONUTES (NOT DE MINITES)

| , STATION: Vermont / | Beverly DATE NET PLATFORM AREA | : 3/14/89 | SY: DAF |
|----------------------|--|-------------------|------------------|
| GCCUPANT LOAD CALCU | | | DESIGN YR |
| PEAK HOUR | | A.M. | Р.М. |
| LINE LOADS: | ONDOGNI DANOSTUO | 8057 2217 | • |
| ENTRAINING LOADS: | ONIBORNO . | 954 300 | 321 401 |
| PEAK 15 MINUTE LOAD | S (=PEAK HR. LOAD x | 1.15 / 41 | |
| LINK LOADS: | INDOUND ONUOSTED | 2017 638 | 776 1652 |
| ENTRAINING LOADS: | OUTROUND INSOUND | 275 87 | 93 116 |
| HEACWAYS: | ENBGUND DUTBGUND | 8.0 6.0 | |
| | AD C=FEAK 15 MIN. 11 INO. OF HEADWAYS | =INTESER(15 | MIN. / HEADWA//I |
| | tur anns | .K.A | |
| | ***** | 1159 | |
| | OF 130 RND | 319 | 924 |
| | TETAL | 1478 | |
| | USE 1964 (10201 | 1478 | 1720 |
| FEAT ENTRAINING EDA | D =CPEAK IS MIA. LOA | (0 % +4 % HE/ | |
| | • | e.X. | |
| | ENSCUND | 41: | |
| | 00136UNB | 170 | 173 |
| | TITAL | 541 | 312 |
| DEMSITY TENET PLATE | DRM AREA / PEAK ENTR | | |
| | | A.N. | |
| (NOT < 4 | SQ.FT. / PERSON1 | 21.50 | 77,18 |
| TOTAL DOCUPANT LOAD | C=CALCULATED TRAIN | | |
| ******** | | A. N. | |
| | TOTAL | 2019 | 1633 |
| Lasser of | _ | <u>.</u> | == |
| AREA/4 or Entraining | | | 1832 |
| TOTAL DEGUEANT LOAD | FUR CALCULATIONS | 2517 | |

SHT 2 OF 3

STATION: Versont / Beverly

DATE: 3/14/89

8Y: DRF

| EXIT | LANES | AND | CAPACITY | PROVIDED |
|------|-------|-----|----------|----------|
| | | | | |

| ELEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | = | FPM | | | |
|-----------|---------------|----------|------------------|----------------------|---|-------------|---------|-------------|------------|
| Platform | to Cancours | 2 | | | | | | • | |
| Stairs | -up | 2 | 3 | 35 | = | 210 | | | |
| | -dawn | ij. | 0 | 40 | = | 0 | | | |
| Escalator | rs-up ± | 1 | 2 | 35 | = | 70 | 9no - £ | escalator o | irscounted |
| | -ฉ่อพก | ij | Ù | 40 | = | 0 | | | |
| Eaer. | -up | 2 | 3 | 35 | = | 210 | | | |
| Stairs | -дана | Û | ð | 40 | = | Q | | | |
| | | | 14 | Total | | 490 | | | |
| | are Barriers | 5 | • • | 12001 | | (,,, | East | West | |
| Turnstile | | 10 | 1 | 25 | = | 250 | 6 | 4 | |
| Fare Gate | | ป | Ī | 50 | = | i) | Ū | J | |
| Service (| | 1 | 2 | 50 | | 160 | 1 | 0 | |
| Emergency | | j | 2 | 50 | = | 300 | 2 | 1 | |
| | , | • | _ | | | | _ | • | |
| | | | | Total | | 6 50 | | | |
| Fare Barr | riers to Safe | Area | | | | | | | |
| Stairs | - և ք | 2 | 3 | 55 | = | 210 | | | |
| | -down | ű | Ó | 4.) | £ | ij | | | |
| Escalator | `5-UP | 2 | 5 | 75 | = | 140 | | | |
| | -Gawa |) | ŷ | 4 0 | = | Ĉ | | | |
| Emer. | -սք | Û | 3 | ₹5 | = | ij | | | |
| Etairs | -ссып | ij | i) | 4:) | = | ð | | | |
| | | | | Total | | 350 | | | |
| | = | MOE BASE | 150 15 51 | | | • | | • | |

FARE BARRIER TEST

Array Capacity of Fare Gates and Turnstiles

Percent of Total Capacity

East West :50

FPM 100 33, 33 50.00 [MCT056%]

EMERGENCY EXIT WIDTH TEST

Minimum Flatform Exit Width

[=Net Platform Area /175q.Ft. per Person < 50 Persons per Ft./]

Minimum Width Requirec = 33,24

#idth Provided =

25.67 ENOT < REQUIREDI

STATION: Vermont / Beverly

DATE: 3/14/89

DRF

Test 1

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Williamiting time at platform exits) = Occupancy Load / Exit Capacity

41 =

2019

490

4.120 Minutes

Test 🗈

Evacuate Total Occupant Load from the most remote point on the platform to a soint of safety in 6 minutes or less.

Walking Time for longest exit route ------

T = T1 + T2 + T3 - T4 + T5

| | | Feet | / FPM | = | Minutes |
|----|----------------------------|------|-------|-----|---------|
| 11 | (platform) | 124 | 200 | | 9.420 |
| 72 | (platform to concourse)-up | 16.5 | 50 | | 0.330 |
| 13 | ion concourse) | 261 | 200 | | 1.309 |
| T4 | (concourse to grade)-up | (3.5 | 50 | | 0.370 |
| 15 | (grade) | Û | 200 | | 6.000 |
| | | | | | |
| | | | | 7 - | ግ ይንፍ |

2.625

wes* 422 $\overline{z}(n)$

2,119

1.624

. Additional Wasting Time at Platform Exits

$$(W1 - 71) = -4.120 - -$$

 $\{\%2 - \%1\} = 2.110 -$

3.500 Minutes

0.000 Minutes

Tine

Additional Wasting Time at Fare Barrier

Occupant Load at Conceptse = Ional Occupant Load - Emergency Stair 4 dinute Capacity

4.120 =

| 201 7 1 | - (4 x | 210 |) = | 1177 | Patrons | | CHECK FOR | JNBALANCED | คยอพ |
|----------------|-------------|-----------|-----------|---------|---------|---------|-----------|------------|------------------|
| | | | | | | | Array | East | ₩ps [†] |
| ₩2 = [gr | course Occu | pant Load | / Gate Ca | apacity | | | Patrons | 758 | 4.22 |
| w2 = | 1179 | | 550 | = | 1.814 | Minutes | Lapacit/ | 456 | 200 |

Additional Naiting Time at Concourse Exits

W3 = Concourse Occupant Load / Exit Capacity

$$W0 = 1179 / 050 = 3.089 + Minutes $(W3 - W_1) = 3.369 - 4.120 = 0.000$ dinutes$$

Total Exit Time [=T+(W1-T1)+(W2-W1)+(W3-W1)]

1314L = 6.125 MINUTES CHOI - 6 MINUTES!

| - STATION: Vermont | Beverly DATE NET PLATFORM AREA | 3/16/89 | BY: CRF |
|---------------------|-----------------------------------|---------------|------------------------|
| OCCUPANT LOAD CALCU | SLATION | | . RY NE18 |
| PEAK HOUR | ··· | A.ä. | ?. X . |
| LINK LJATS: | TNBOUND | 8057 | 2678 |
| | онтеанно | 2217 | 3746 |
| ENTRAINING LEADS: | פאטספא ז | 954 | 321 |
| | DUTROUND | 200 | 401 |
| PEAK 15 MINUTE LOAD | S [=FEAK HA. LGAD x | 1.15 / 41 | |
| LINK LOADS: | INBOUND | 2317 | 776 |
| | SUTBOUND | 639 | 1652 |
| ENTRAINING LOADS: | | 175 | 93 |
| | OB180UND | 37 | 116 |
| HEADWAYS: | INBGUN O | 5.0 | 6. 0 |
| | DAUGGTUG | 6.0 | 5.0 |
| CALCHEATES TRAIN LE | | | |
| | ING. OF HEADWAYS | | t. / HEAJWARII 5.M. |
| | INEGUNO | 1159 | |
| | SUTBOUND | 519 | 919 |
| | TOTAL | 1473 | 1214 |
| | 63E CNOT 10101 | 1478 | :720 |
| ARAF ENTRAINING LGA | | | |
| | - - 1886085 | 6.∦. 41: | 2.8. 179 |
| | - Englishing - SUISTIND - F | | 175 175 |
| | | | |
| | TOTAL | 51. | 717 |
| JENSITY CHNET FLATS | GAM AREA / PEAK ENT | RAINING LOADI | |
| | | A. H. | 5,5, |
| ENOT < 4 | SQ.FT. / PERSON) | 21.59 | J7.28 |
| 1074L GCCUPANT LGAD | (=CALCULATED TRAIN | | |
| | | A.K. | 7.M. |
| Leaser of | TOTAL | 2019 | .501 |
| AREA/e or Entraidin | ç Load + Trait woad | 1019 | 1632 |
| TOTAL OCCUPANT LOAD | FOR CALCULATIONS | 2914 | |

EMERGENCY EXIT CAFACITY

, SHT 3 OF 3

STATION: Vermont / Beverly DATE: 3/15/39 9Y: 59F

EXIT LAMES AND CAPACITY PROVIDED

| ELEMENT | MEITDERIC | MUMBER | x LANES | * CAPACITY / LANE | = | 2PM | | | |
|-----------|---------------|--------------|---------|-------------------|---|-------------|-----------|----------|------------|
| _ | n to Concours | | | | | | | | |
| Stairs | -00 | <u>"</u> | 3 ' | 35 | = | 210 | | | |
| | -down | ā | Ú | | = | Ú | | | |
| | rs-up | 2 | | 35 | | 140 | | | scounted |
| 65101011 | -down | ō | 2 0 | 40 | | Ú | | | 2204.1664 |
| Eaer. | | 2 | 3 | | = | 210 | | | |
| | -dawa | õ | Ú | | = | Ú | | | |
| - | | | - | | | | | | |
| | | | 15 | Total | | 560 | | | |
| Through | Fare Barci≘rs | , | | | | | East | West | |
| Turastil | es | - 10 | : | 25 | = | 250 | Ś | 4 | |
| Fare Sat | es | Ú | 1 | 150 | I | ý | ũ | ij | |
| Service | Gates | ! | - | 50 | = | 1%0 | 1 | 0 | |
| Emergeno | 3 Gates | 3 | 2 | 50 | = | 3 <i>00</i> | 2 | 1 | |
| | | | | | | | | | |
| | | | | Total | | o50 | | | |
| | riers to Safe | | | | | | | | • |
| Etairs | | 2 | 7 | 74 74 | ± | 210 | | | |
| | TROWN | ζ, | Ú | 4 17 | = | Ú | | | |
| Escalato | rs-up t | 1 | 3 | 2.5 | = | 7. | * ~ one e | scalator | discounted |
| | nact- | Į) | ō | ∳ê | I | () | | | |
| £aer. | -up | Ú. | ü | 75 | = | ý | | | |
| Stairs | - 10v:n | 12 | ÷ | 46 | ī | ô j | | | |
| | | | | | | | | | |
| | | | | Total | | 290 | | | |

FARE BARBIER TEBT

| Arr | ay East | ves: | |
|-----------------------------------|----------|-------|------------|
| Capacity of Fare Bates and Turnst | iles 150 | j.a) | PPM |
| percent of Total Capaci | ty 33,33 | 50.00 | (NOT) 5013 |

EMERGENCY EXIT WIDTH TEST

Risiaum Platform Exit Width ------

1=4et Flatford Area /178q.Ft. psh Ferson x 50 Persons per Ft.)1

EMERGENCY EXIT CAPICITY TESTS ------

SHT 3 OF 3

BTATION: Vermont / Beverly

DATE: 3/16/39 9Y:

DRF

Test !

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

will(waiting time at platform exits) = Occupancy Load / Exit Capacity

∦! = 2019 / 550 3.605 Minutes

.est 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

| · _ | * * | | 7 7 | | • • | : | T 1 | | 7 5 |
|-----|-----|---|-----|---|-----|---|-----|---|-----|
| - | 1: | * | i | т | | ٠ | • | Ŧ | 1.0 |

| | | Feat | : FPM | = | Minutes |
|----|----------------------------|----------|----------------------------------|---|---------|
| i: | (platform) | 4 | $\langle \cdot, \rangle \rangle$ | | 0.820 |
| 12 | iplations to concourse) wo | .6.5 | 50 | | 0.530 |
| 13 | (or concourse) | 261 | $2\phi 0$ | | 1.305 |
| 14 | (contourse to grade)-up | 16.5 | 50 | | 0.370 |
| 15 | (grade) | <u> </u> | 200 | | 9.500 |
| | | | | | |
| | | | | | |

T = 2.525

Additional waiting Time at Flatform Edits

(#1 - 71) = 0.40E -0.526 = 2,985 Minutes

Additional Waiting Time at Fare Earnier

Stoudant Load at Concourse = Total Scoupant Load - Emergency Stair 4 tirule Departur

|] ₀ \$. | | 310 | , = | 1177 | -atrons | | 1421 - 36 | JUSA LANGUE | |
|----------------------|-------------|----------|-------------|--------------|---------|---------|-----------|-------------|-------|
| | | | | | | | acrav | cast | 6 £ t |
| .¥2 = Eanogu | ırse üccuş. | ant Load | / Gate Capa | <u>icity</u> | | | annass. | 3:: | 767 |
| ¥2 = | 1179 | i | 650 | = | 1.814 | Minutes | lapacit; | ÷5. | 100 |
| 3W1 = W1/= | 1.345 | - | 5,605 | = | 0.00 | dinites | lite | 1.311 | 1.545 |

Additional Waiting Time at Concourse Exits

WD = Concourse Occupant Loso / Exit Capacity

40 ± 100 € 110 ± 150 ± 4.304 dieutes 90 - 4, = 4,2,1 -0.805 Minutes J. 465

Total Eric Time : [=T+:N1-]):-(WZ-w, -- WJ-w())

TATAL # 5.015 MINUTES (1407 - 8 MINUTES)

| STATION: Hollywood | I/Western DATE: NET PLATFORM AREA = | | BY: JAF |
|----------------------|--|----------------------|----------------|
| OCCUPANT LOAD CALCU | | | DESIGN YR |
| PEAF HOUR | | A.M. | 2. %. |
| CINK LOADS: | ONUGBNI Onuostuc | 5786 2012 | 2167 472: |
| ENTRAINING LOADS: | EMBOUND Dutbound | 36 2 503 | 348 376 |
| PEAK 15 MINUTE LOAD | S C=PEAK HR. LOAD 4 | 1.45 / 41 | |
| LINK LGADS: | ENBOUND ONDESTUD | 1264 579 | 624 1353 |
| ENTRAINING LOADS: | DANDORAL DANDORAL | 248 145 | 101 114 |
| HEADWAYS: | INBOUND OUTEOUND | 3.0 5.0 | 5.0 6.0 |
| | AD (=FEAR 15 MIN. LI ING. OF HEADWAYS | | |
| | | £.3. | |
| | IN8CONS | 332 | 712 |
| | ONTROUND | 290 | 579 |
| | TETAL | 1:32 | 391 |
| | 1SE INOT : 13201 | | 1320 |
| REAK ENTRAINING LOA | iD =69EAN 15 MIN. 604 | | _ |
| | | ė.d. | |
| | 1580000 1575 1565 | 371 217 | 171 |
| | EUTP3UND | | |
| | JATEL | 538 | 737 741 |
| JEMSITY CONET PLATE | GAM AREA / PEAK ENTR | AINIRG LOADI A.M. | 2.8. |
| CNOT (4 | SOLFT. / PERSONI | | 75.12 |
| TOTAL DECUPANT LOAD | C=CALCULATED TRAIN | | |
| | | n.i. | តិ.គឺ . |
| | TOTAL | 1903 | 1542 |
| yesser of _ | | | |
| | g load + Train Load | | 1542 |
| TOTAL BOODERANT LOAD | HEUR CALCULATIONS | 1903 | |

SHT 2 OF 3

| STATION: Hollywood/Western | - |
|----------------------------|---|
|----------------------------|---|

n DATE: 3/14/89

97: DAF

| EXIT LANES AND CAPI | HETIL | LWDAIAEA |
|---------------------|-------|----------|
|---------------------|-------|----------|

| | |
|------|------|

| SLEMENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | = | PPM | | | |
|-----------|---------------|--------|---------------|-------------------|----|-------------|-----------|------------|------------|
| - | to Concours | | | | | | | | |
| Stairs | | - | 3 | 35 | z | 210 | | | |
| | -gown | Ú | Ú | 4 <i>ù</i> | = | . 0 | - | | |
| Escalator | rs-d p | 2 | 2 | 35 | ŧ. | 140 | | | scounted |
| | -down | 4) | ;) | 40 | = | 0 | | | |
| Emer. | -42 | 2 | 3 | 35 | = | 210 | | | |
| Stairs | -dewn | Ú | ı) | 4:) | = | 0 | | | |
| | | | 16 | Totai | | 540 | • | • | |
| - | Fare Barriers | | •• | 10101 | | 147 | East | vest | |
| | | | 4 | | | 25.3 | 4 | | |
| Turnstil | | 10 | 1 | 25 54 | | 250 | 6 | į | |
| | 2 5 | | 1 - | | = | Û | | 1) | |
| | Bates | | <u>.</u> 7 | | ŧ | 100 . | • | ŋ | |
| Emergency | y Gates | 9 | 2 | 59 | ¥ | 200 | 2 | 1 | |
| | | | | Total | | 65 0 | | | |
| Fare Bass | riers to Safa | Area | | • | | | | | |
| Stairs | -up | 2 . | 5 | 7.= | = | 210 | | | |
| | -down | J | | 4.) | = | Ú | • | | |
| Escalator | 's-@p ∮ | 1 | <u>:</u> | 35 | = | 7.) | + - one e | scalator o | discounted |
| | השכם- | ŷ | ;} | 40 | = | ģ | | | |
| ćπer. | -6 p | Ü | ij | 35 | = | ύ | | | |
| Stairs | -down | ÷ | į, | 40 | = | ŋ | | | |
| | | | | | | | | | |
| | | | | Tatal | | 289 | • | • | |

FARE BARRIER TEST

| Arı | ay East | Hest | |
|-----------------------------------|-----------|--------|-------------|
| Capacity of Fare Gates and Turnst | tiles 150 | 100 | PFH |
| Percent of Total Capaci | ty 33,33 | 50.(a) | ENOT >50% J |

EMERGENCY EXIT WIDTH TEST

Minimum Flatform Exit Width -----

I=Net Platform Area /175q.St. per Person 4 50 Persons per Ft.))

Minimum width Required = 37.24

Width Frovided =

19.30 (NOT (REQUIRED)

SHT I OF I

STATION: Hollywood/Western

DATE: 3/14/89

B/: DRF

Test i

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

Williamiting time at platform exits) = Occupancy Load / Exit Capacity

W1 = 1908 / 560 = 3.407 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route

T = T1 + T0 + TT + T4 + T5

| 1 = 11 + 12 + 15 + 14 + 15 | Feet | / F9H | 2 | Minutes |
|-------------------------------|------|-------|---|---------|
| Ti (platform) | 124 | 200 | | 0.620 |
| 12 (platform to concourse)-up | 15.5 | 50 | | 0.350 |
| () (on contourse) | 261 | 200 | | 1,305 |
| T4 (concourse to grade)-up | 19.5 | 50) | | 0.370 |
| TS (grade) | Ú | 200 | | 0.000 |
| | | | | |
| | | | | |

T = 2.625

Additional Naiting Time at Flatform Exita

(W1 - T1) = 3.407 - 0.620 =

2.737 Minutes

Additional Waiting Time at Fare Barrier

Occupant Lyad at Concourse = Total Occupant Loso - Emergency Stair & Minute Capacity

| 1908 - (4 / 216 | | |) = | 1953 | Patrons | | CAEEN FIR | CAECN FOR BODALANCED FLOW | | | |
|-----------------|-----------|------------|-----------|--------|------------------------------------|---------|-----------|---------------------------|-------|--|--|
| | | | | | | | Arran | East | es: | | |
| W2 = Conc | ourse Occ | upant Load | / Gate Ca | pacity | | | - fatrons | 135 135 | 774 | | |
| 42 = | 8601 | 1 | 651) | 2 | 1.643 | Minutes | Capacity | 456 | 360 | | |
| (WI - WI) | = 1.570 | - | 3.467 | = | $\hat{\phi}_{\bullet}(\hat{\phi})$ | Minutes | (1#e | 1.533 | 1.270 | | |

Additional Waiting Time at Concourse Exits

W3 = Concourse Occupant Load / Exit Capacity

Total Exit Time {=T+(W1-T1)++W2-W1/+(AJ-W1+)

ISSUEMEN & TOME SETUDIAL FIRST SEMENTESS

| LINK LOADS: INBOUND 579& 2157 OUTBOUND 2012 4721 ENTRAINING LOADS: INBOUND 362 348 OUTBOUND 503 396 FEAR 15 MINUTE LOADS (=PEAK HR. LOAD x 1.15 / 41 LINK LOADS: INBOUND 1664 524 OUTBOUND 577 1358 ENTRAINING LOADS: INBOUND 248 101 OUTBOUND 145 114 HEADMAYS: INBOUND 3.0 5.0 5.0 OUTBOUND 5.0 6.0 CALCULATED TRAIN LOAD (=FEAK 15 MIN. LINK LOAD / (NO. OF HEADMAYS)) | | d/Nestern DATS NET PLATFORM AREA | = 11632 | |
|--|---------------------|-------------------------------------|---------------|------------------|
| LINK LOADS: INBOUND 5786 2187 OUTSOUND 2012 4721 ENTRAINING LOADS: INBOUND 962 348 OUTBOUND 503 396 FEAR 15 MINUTE LOADS (=FEAK HR. LOAD x 1.15 / 41 LINK LOADS: INBOUND 1664 524 OUTBOUND 577 1358 ENTRAINING LOADS: INBOUND 248 101 OUTBOUND 145 114 HEADMAYS: INBOUND 6.0 5.0 5.0 OUTBOUND 5.0 6.0 CALCULATED TRAIN LOAD (=FEAK 15 MIN. LINK LOAD / (NO. OF HEADMAYS)) | DECUPANT LOAD CALC | ULATION | | DESIGN YR |
| ENTRAINING LOADS: INBOUND 362 348 | PEAK HOUR | | А.н. | ?. ዘ. |
| ENTRAINING LOADS: INBOUND 00160UND 503 396 FEAK 15 MINUTE LOADS (=PEAK MR. LOAD x 1.15 / 41 LINK LOADS: INBOUND 1664 524 | LINK LOADS: | INBOUND | 5798 | 2157 |
| DUTSOUND 5-03 396 | | CNUOCTUG | 2012 | 4721 |
| ### FEAR 15 MINUTE LOADS (=PEAK HR. LOAD x 1.15 / 41 LINK LOADS: IMBOUND | ENTRAINING LOADS: | INBOUND | | |
| LINK LOADS: INBOUND 1577 1758 ENTRAINING LOADS: INBOUND 248 101 | | CHUDATUO | 503 | 396 |
| DUTBOUND 577 1258 | FEAK 15 MINUTE LOA | OS (=PEAX HR. LDAD x | 1,15 / 41 | |
| ENTRAINING LOADS: INBOUND 0145 104 HEADWAYS: INBOUND 3.0 5.0 5.0 DUTBOUND 5.0 6.0 CALCULATED TRAIN LOAD (=FEAK 15 MIN. LINK LOAD / (NO. OF HEADWAYS)) | LINK LOADS: | INBOUND | 1564 | 524 |
| HEADWAYS: INBOUND 3.0 5.0 5.0 | | ORNOGER | 577 | 1358 |
| HEADWAYS: INBOUND 3.0 5.0 5.0 | ENTRAINING LOADS: | INBOUND | 248 | 101 |
| CALCULATED TRAIN LOAD (==SEAK 15 MIN. LINK LOAD / (NO. OF READWAYS)] | • | | 145 | 114 |
| CALCULATED TRAIN LOAD (==SEAK 15 MIN. LINK LOAD / (NO. OF READWAYS)] | HEADWAYS: | Inbound | ò.0 | 5.0 |
| ENG. OF HEADWAYS =INTEGER(IS MIN. / HEADWAY)] A.M. P.M. P | | COMBOSTEC | 8. Ú | 5. 0 |
| A.M. P.M. F.M. P.M. | | | | |
| INBGUND 332 312 00790LND 290 579 579 | | ENO. OF HEADWAYS | | |
| DUTBOUND 290 679 | | INACHNA | | |
| ### USE [NOT (1320] 1320 1320 #### PEAK ENTRAINING_LOAD = CPEAK 15 MIN. LOAD x 14 x HEADWAY / 15 MIN.)] ################################### | | | | |
| ### USE [NOT (1320] 1320 1320 #### PEAK ENTRAINING_LOAD = CPEAK 15 MIN. LOAD x 14 x HEADWAY / 15 MIN.)] ################################### | | TETAL | 1122 | 991 |
| A.M. P.S. | | | | |
| INSOUND 171 151 151 151 151 151 151 151 151 151 151 151 151 151 151 151 151 151 151 152 153 152 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 153 154 154 153 154 154 153 154 154 153 154 154 153 154 154 153 154 154 153 154 | PEAK ENTRAINING LO | AD =[FEAK 15 MIN. LO | AD 3 (4 x HEA | DWAY / 15 MIN.)] |
| TOTAL 198 122 | | - - | 4. Y. | 2.3. |
| ### TOTAL ### 1988 122 DEASITY (=NET PLATFORM AREA / PEAK ENTRAINING LOAD) | | INSOUND | 371 | 151 |
| OEASITY C=NET PLATFORM AREA / PEAK ENTRAINING LOAD A.M. 5.M. 6.M. 5.M. 6.M. 5.M. 6.M. 6.M | | OL TBOUND | 2.7 | 171 |
| A.M. 5.M. [NOT (4 39.FT. / PERSON) 19.76 35.12 TOTAL GCCUPANT LOAD [=CALCULATED TRAIN LOAD + PEAK ENTRAINING LOAD] | | FOTAL | 199 | 727 |
| ### (### 1998 | DENSITY CONET PLATE | FORM AREA / PEAK ENTI | RAINING LOADI | |
| TOTAL GCCUPANT LOAD C=CALCULATED TRAIN LOAD + PEAK ENTRAINING LOAD 1 | | | A.K. | 5.M. |
| ### A.M. #P.M. **TOTAL 1908 1642 Lesser of ################################### | . €NOT ← 4 | 39.FT. / PERSON) | 17.78 | 35.12 |
| TOTAL 1908 1642 Lesser of AREA/4 or Entraining Load + Train Load 1908 1642 | TOTAL GCCUPANT LOAD | C=CALCULATED TRAIN | | |
| Lesser of AREA/4 or Entraining Load + Train Load 1908 (642) | | • | | |
| AREA/4 or Entraining Load + Train Load 1908 (642) | Lacser of | TOTAL | 1908 | 1647 |
| | | o load + Train load | 1509 | 1647 |
| | | | | in the |

SHT 2 OF 3

| STATION: | Hol I ywood | 1/Western | DATE | : 3/14/89 | Bí: | ERF | | | |
|----------|-------------|-------------|---------|----------------------|------------|-------------|-----------|-----------|------------|
| EXIT LAN | ES AND CAP | ACITY PROVI | DED | | | | | | |
| ELEHENT | DIRECTION | NUMBER | x LANES | x CAPACITY / LANE | z | PPM | | | |
| Platfora | to Concour | . 26 | | | | | | | |
| Stairs | -up | 2 | 3 | 35 | = | 210 | | | |
| | -40MU | ō | Ů | 46 | = | 0 | | | |
| Escalato | rs-up f | i | . 2 | 35 | = | 70 | f - one i | escalator | discounted |
| | -down | 0 | ō | 40 | | 0 | | | |
| ćmer. | -up | 2 | 3 | 35 | | 210 | | | |
| | -down | 0 | Ú | 40 | = | 0 | | | |
| | | | 14 | Total | | 470 | | | |
| - | Fare Barrie | | | | • | | East | West | |
| Turnstil | | 10 | i | 25 | | 250 | ó | 4 | |
| Same Sat | es | 1) | 1 | 50 | = · | i) | 0 | 0 | |
| Service | Sates | 1. | 2 | 50 | | 100 | i | 0 | |
| Emergenc | y Gates | 3 | 2 | 50 | = | 500 | 2 | i | |
| | | | | | | | | | |
| | | | | Total | | 55 0 | | | |
| Fare Bar | riers to Ga | fe Area | | | | | | | |
| Stairs | -пb | 2 | 3 | 35 | = | 210 | | | |
| | -down | () | 0 | 40 | = | Ģ | | | |
| Escalato | rs-up | 2 | 2 | 55 | = | 140 | | | |
| | -down | G | 9 | 40 | = | Ü | | | |
| Smer. | -1p | Ŋ | ŷ | 35 | 2 | ن | | | |
| Stairs | -down | 9 | ð | 46 | = | ê | | | |
| | | | | | | | | | |
| | | | | [otal | | 350 | | | |
| • | | FARE BARR | | | | | | | |
| | | | Array | East | West | | | | |

EMERGENCY EXIT WIDTH TEST

Capacity of Fare Gates and Turnstiles

Percent of Total Capacity

. Minimum Flatform Exit Width ______

Tamet Alatform Area /175g.Ft. per Person x 50 Persons per Ft.))

Minimum Width Required = 33.34

kidth ∂ravided =

25.47 (MOT (REGULAÇO)

150

33.33

PPH

50.00 (NGT)50%I

105

SHT 3 0F 3

STATION: Hollywood/Western

DATE: 3/14/89

8Y: DRF

Test 1

Evacuate Total Occupant Load from Platform(s) in 4 minutes or less.

W1(waiting time at platform exits) = Occupancy Load / Exit Capacity

11 = 1908 490 =

3.894 Minutes

Test 2

Evacuate Total Occupant Load from the most remote point on the platform to a point of safety in 6 minutes or less.

Walking Time for longest exit route ...

T = T1 + T2 + T3 + T4 + T5

| , | Feet | / FPM | = Minutes |
|-------------------------------|------|-------------|-----------|
| T1 (platform) | 124 | 26 0 | 0.620 |
| T2 (platform to concourse)-up | 16.5 | 50 | 0.330 |
| T3 (on concourse) | 261 | 200 | 1, 305 |
| T4 (concourse to grade)-up | 19.5 | 50 - | 0.370 |
| TS (grade) | Ó | 200 | 0.009 |
| - | | | |
| | | - | |

T = 2,625

Additional Waiting Time at Flatform Exits

-----(W1 - T1) = 3.894 -

0.520 =

3.274 Minutes

Additional Waiting Time at Fare Barrier

Occupant Load at Concourse = Iscal Decupant Load - Emergency Stair 4 Minute Capacity

| 1908 | 908 - :4 x 210) = 1068 Patrons | | | | | CHECK FOS | FLOW | | |
|-----------|---------------------------------|-----------|------------|--------|--------------------------------|-----------|----------|-------|----------|
| | | | | | | | Array | East | West |
| W2 = Cond | iourse Occu | pant Load | √ Gate Cap | pacity | | | Fatrons | 487 | 382 |
| ¥2 = | 1068 | 1 | 550 | = . | 1.643 | Minutes | üapacity | 450 | 200 |
| 492 - 81) | = 1.9(0 | - | 3,874 | = | $\theta_{\bullet}\theta(\phi)$ | Minutes | J:ne | 1.5.7 | [. 7 (a) |

Additional Maiting Time at Concourse Exits

NS = Concourse Occupant Load / Exit Capacity

W3 = 1068 / 350 = 5.051 Minutes (43 - 41) = 3.051 -3.874 = 0.000 Minutes

Total Exit Time [=T+(N1-T1)+(N2-N1)+(N2-N1)]

TOTAL = 5.899 MINUTES [NOT) & MINUTEST

MAY 2.2. 1989 D.C.C.

May 19, 1989

MAY 22 1989

SAFETY & ASSURANCE

Mr. Malcolm Ingram Metro Rail Transit Consultants 548 South Spring Street, 7th Floor Los Angeles, California 90013

B331 PRE-FINAL DESIGN REVIEW

Malcolm:

This is to confirm our telephone conversation of May 19, 1989.

We have prepared hydraulic calculations for the wet standpipe system shown on the drawings. The pipe sizes shown are adequate to produce the required 500 gpm flow. A copy of the calculations is attached.

If you have any questions, please contact us.

Sincerely,

David R. Fiedler, P.E.

DRF:klr - H3275

Attachments

5229C

Page 1 A:\B331WSP2

Date: May 18, 1989

. JOB TITLE: H3275.01 B331 STANDPIPE

WATER SUPPLY DATA

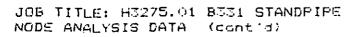
| SOURCE NODE | STATIC PRESS. | RESID. PRESS. | FLOW @ | AVAIL. PRESS. @ | | RE01D PRESS. |
|----------------|------------------|------------------|-----------|--------------------|-------|-----------------|
| TAG | (PSI) | (PSI) | (GFM) | (FSI) | (GPM) | (PSI) |
| 1 | 69.0 | 20.0 | 2235.0 | 65. 9 | 500.1 | 35.1 |

AGGREGATE FLOW ANALYSIS:

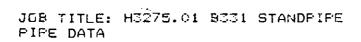
| TOTAL | FLOW | AT SOUR | RCE | | | 500.1 | GFN |
|-------|------|----------|------------|-----|---------|-------|-----|
| TOTAL | HOSE | STREAM | ALLOWANCE | AT | SCURCE | 0.0 | GPM |
| OTHER | HOSE | STREAM | ALLOWANCES | 3 | | 0.0 | GPM |
| TOTAL | DISC | HARGE ES | ROM ACTIVE | SEF | TAKLERS | 500.1 | GEM |

NODE ANALYSIS DATA

| NODE TAG | ELEVATION (FT) | NODE TYPE | FRESSURE (PSI) | DISCHARGE (GFM) |
|----------|-------------------|-----------------|-------------------|--------------------|
| 2 | 514.0 | | 65.4 | |
| J. | 509.0 | | 67.2 | |
| 4 | 509.0 | | 67.1 | |
| 5 | 506.0 | | 68.4 | |
| 6 | 509.0 | - | 67.0 | |
| 7 | 509.0 | | 67.0 | |
| 5 | 509.0 | | 57.1 | |
| 7 | 506.0 | | 53.4 | · - |
| 10 | 500.0 | | 70.7 | |
| 1.1 | 500.0 | ' — | 70.0 | |
| 12 | 499.6 | <u> </u> | 49.B | · |
| 13 | 503.0 | | 67.7 | |
| 1-4 | 506.0 | - - | 46.J | |
| 15 | 506.0 | | 55.2 | |
| 16 | 478.0 | | 89.3 | |
| 17 | 497.0 | | 69.1 | |
| 18 | 497.0 | | 68 . 4 | |
| 18A | 495.0 | - | 68.4 | |
| 185 | 501.0 | | కర.ఫో | |
| 1.7 | 495.0 | | 68.l | |
| 20 | 495.0 | | 57.9 | |
| 1 | 495.0 | | 67.3 | |
| 22 | 499. Ö | - | 65. 2 | - |
| 23 | 502.0 | | 65.4 | - |
| 24 | 502.0 | | 53 . 4 | |
| 25 | 494.0 | | 66.B | |
| 26 | 493.0 | | ర ద. 4 | - |
| 27 | 492.0 | | 66.0 | |
| 27A | 492.0 | _ | 65.4 | |
| 27B | 497.5 | | 63.3 | |
| 28 | 491.0 | | 45 .5 | |
| 29 | 490.0 | K≃31.00 | 65. 0 | 250.0 |
| 30 | 490.0 | K=31.00 | 65. 0 | 250.0 |
| 3t | 495.0 | | 62.9 | |



| NODE TAG | ELEVATION (FT) | NODE TYPE | PRESSURE (PSI) | DISCHARGE (GPM) |
|-------------|-------------------|---|-------------------|--------------------|
| 32 | 498.0 | | 61.7 | ~ |
| 33 | 498.0 | | 6i.7 | |
| 34 | 496.0 | | 62.6 | ~ |
| 35 35 | 494.0 | | 63.4 | |
| 34 36 | 495.0 | | 53.0 | |
| | | | 62.1 | |
| 37 | 497.0 | | 60.0 | |
| 38 38 | 502.0 498.0 | | 61.7 | |
| 39 | | - | 61.7 | |
| 40 | 500.0 | = | 60.0 | |
| 41 | 502.0 | | 50.0 50.0 | |
| 42 | 502.0 | | | |
| . 4조 | 500.0 | | 60.8 /• 7 | |
| 44 | 499.0 | | 61.7 | |
| 45 | 497.0 | | 62.1 | |
| 4.5 | 502.0 | | გა.ი /3 | ~ - - |
| 47 | 496.0 | · - · - -· - | 62.6 | ~ |
| 48 | 473.0 | | 63.9 - | |
| 49 | 491.0 | | 64.7 _ | ~- · |
| 50 | 498.0 | | 61.7 | ~ |
| 51 | 478.0 | | 61.7 | · |
| 52 | 478.0 | | 61.7 | |
| 53 | 495.0 | | 63.O | ~ |
| 54 | 490.0 | | 65.5 | |
| 55 | 491.0 | | 6 5. 6 | |
| 56 | 491.0 | | 65. 1 | |
| 57 | 472.0 | | 65. 0 | |
| 5 8 | 497.0 | | 53.8 | <u> </u> |
| 59 | 492.0 | -· | 65.3 | ~ |
| ဂ ်ပ | 493.0 | | 66.4 | |
| 61 | 494.0 | | 55.5 | |
| 62 | 502.0 | | 63.4 | |
| 63 | 502.0 | | 6J.5 | ~· |
| <u>54</u> | 499.0 | - | 54. 8 | |
| 5 5 | 495.0 | | 66.9 | - - |
| 65 | 495.0 | | 67.6 | |
| 67 | 495.0 | ws | 67.9 | |
| 55 | 496.0 | | 68. 3 | <u> </u> |
| 69 | 501.0 | | စ်စ်.1 | |
| 70 | 497.0 | | 63.2 | |
| 7 i | 497.0 | - | 63.9 | |
| 72 | 478.0 | | 69.2 | |
| 73 | 504.0 | | 66.2 | ~ - |
| 74 | 506.0 | | 66.3 | , |
| 7 5 | 503.0 | | 67.6 | |
| 76 | 499.0 | | 69.7 | |
| 70 77 | 500.0 | | 69.9 | . |
| 79 78 | 500.0 | . | 70.6 | |
| 1 | 537.0 | SOURCE | 35.1 | 500.1 |

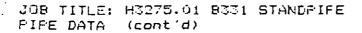


| Ē | E TAG END ELEV. DDES (FT) | NOZ. (K) | PT (PSI) | DISC. (GPM) | VEL (FFS | DIA(IN) L) HW(C) F.L./FT | (FT) | SL | M. |
|---------------|---------------------------------|-------------|----------------|-------------|--------------|----------------------------------|----------------------|----------------|--------------------|
| 1 2 | Pipe: 1 587.0 514.0 | SRCE 0.0 | 65.4 | 0.0 | 3.1 | 0.002 TE | 458.00 573.00 | PE FV | 1.4 31.6 0.0 |
| . 2 3 | Fipe: 2 | 6.6 | 45 1 | Ö. 0 | 500.0 5.6 | 6.065 PL 120 FT/3 0.010 TL | 20.00 F | FF FF | 0.3 2.2 0.2 |
| ত্র 4 | Pipe: 3 509.0 509.0 | 0.0 0.0 | 67.2 67.1 | o.o o.o | 250.0 2.8 | 6.085 PL 120 FTG 0.003 TL | 4.00 T 34.00 | 원도 원원 원۷ | 0.0 0.0 0.0 |
| 4 5 | Fipe: 4 509.0 506.0 | 0.0 | | 0.0 | 0.0 | | T | ₽E | 0.0 1.3 0.0 |
| 4 6 | Pipe: 5 509.0 509.0 | 0.0 | | 0.0 | 2.8 | | Т | PE | 0.0 |
| 6 10 | Fipe: 6 . 509.0 500.0 | 0.0 | 67.0 70.7 | 0.0 | 250.0 2.8 | 6.045 PL 120 FTG 0.003 TL | 70.00 E 84.00 | PF PE PV | 0.2 3.9 0.0 |
| 6 7 | Fipe: 7 509.0 509.0 | 0.0 | 67.0 67.0 | 0.0 | 0.0 | 6.045 PL 120 FTG 0.000 TL | | PE PE PV | 0.0 0.0 0.0 |
| 1 O 1 1 | Fipe: 8 - 500.0 500.0 | 0.0 | 70.7 70.6 | 0.0 0.0 | 250.0 2.8 | 6.065 PL 120 FTG 0.003 TL | 250.00 250.00 | PF PE PV | 0.7. 0.0 0.0 |
| 1 1 1 2 | Pipe: 9 500.0 499.0 | 0.0 | 70.0 . 69.8 | 0.0 0.0 | 250.0 2.8 | 6.065 PL 120 FTG 0.003 TL | 250.00 250.00 | PE PE PV | 0.7 0.4 0.0 |
| 12 13 | Pipe: 10 499.0 503.0 | | | | 2.8 | 4.045 FL 120 FTS 0.003 TL | E | FIE | 0.4 1.7 0.0 |
| 1.3 1.4 | | 0.0 | 67.7 66.3 | 0.0 0.0 | 2.8 | 6.065 PL 120 FTG 0.003 TL | T | PΞ | 0.0 1.3 0.0 |
| 14 15 | Pipe: 12 506.0 506.0 | | | 0.0 0.0 | 2.7 | 6.065 PL 120 FTG 0.003 TL | T | ïE | 0.0 0.0 0.6 |
| 14 74 | | 0.0 | | . 0.0 | 0.0 | 6.065 PL 120 FTG 0.000 TL | | FΕ | 0.0 |

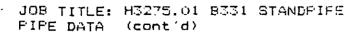


JOB TITLE: H3275.01 B331 STANDFIFE FIFE DATA (cont.d)

| | MD | | | | | VEL (FPS |) HW(C) | LENGTH (FT) | SI | UM. |
|------------|------|-------------------------|------------------|----------------------|------------|--------------|--------------------------------|--------------------------------|----------------|-------------------|
| 15 | Fipe | : 14 506.0 493.0 | 0.0 0.0 | 66.2 69. 3 | 0.0 0.0 | 2.7 | 120 F | _ 125.00 Г6 — Е _ 139.00 | PE PE PV | 0.4 3.5 0.0 |
| 1.5 1.7 | Pipe | : 15 498.0 497.0 | 0.0 | 69.3 69.1 | 0.0 | 245.3 2.7 | 6.065 Pt 120 Ft 0.003 Tt | _ 250.00 76 | PE PV | 0.7 0.4 0.0 |
| 17 18 | · | : 16. 497.0 497.0 | 0.0 | 69.1 68.4 | 0.0 0.0 | 2.7 | 6.065 Pt 120 F1 0.003 Tt | _ 250.00 | FF FE FV | 0.7 0.0 0.0 |
| 18 | - | | \circ , \circ | | | 2.7 | 4.045 Pt 120 FT 0.003 Tt | | FF FE FV | 0.4 0.4 0.0 |
| 13A | | | 0.0 | | 0.0 | 0.0 | 4.026 Pt 120 F1 0.006 Tt | rg | FF FE FV | 0.0 2.2 0.0 |
| | · | : 19 495.0 495.0 | 0.0 | 58.4 68.1 | 0.0 | .2.7 | 6.065 PL 120 FT 0.003 TE | TG | PF FE PV | 0.3 0.0 0.0 |
| 19 20 | · | | 0.0 | | 0.0 | 2.7 | 6.065 PE 120 FT 0.003 TE | rG | PE PV | 0.7 0.4 0.0 |
| | • | : 21 495.0 495.0 | 0.0 0.0 | 67.9 67.3 | 6.0 | 2.7 | 4.065 Pt 120 F1 0.003 TL | 250.00 G 250.00 | 64 64 64 | 0.7 0.0 0.0 |
| 21 22 | Fipe | : 21A 475.0 477.0 | 0.0 | | 0.0 | 2.7 | 120 FT | 125.00 G E . 139.00 | F'E | 1.7 |
| 22 23 | Fipe | 499.0 | 0.0 0.0 | | | 2.7 | 120 FT | 125.00 7G T 155.00 | | 0.4 1.3 0.0 |
| 23 24 | • | | | | | 2.7 | | 4.00 TG T . 34.00 | PF FE FV | 0.0 0.0 0.0 |
| 24 62 | Fipe | : 24 502.0 502.0 | | 63.4 63.4 | 0.0 0.0 | -35.3 0.4 | 6.065 PE 126 FT 0.000 TE | rg | PE PE PV | 0.0 0.0 0.0 |
| 24 25 | Fipe | | 0.0 | | | 3.1 | 6.065 PE 120 FT 0.003 TE | | FF FE FV | 0.0 3.5 0.0 |



| | ELEV. | | | | VEL (FPS |) HW(C) | D LENGTH (FT) | 3 | SUM. |
|------------------|-------------------------|-------------|--------------|------------|----------|---------|---------------------------------|----------------|---------------------|
| Pip 25 25 | 494.0 | 0.0 0.0 | 65.8 65.4 | 0.0 | 3.1 | 120 | PL 250.00 FTG TL 250.00 | FΕ | 0.8 0.4 0.0 |
| Pip 26 27 | 493.0 | 0.0 | 65.4 66.0 | 0.0 | 3.1 | 120 | PL 250.00 FTG TL 250.00 | PΞ | 0.8 0.4 0.0 |
| Pip 27 27A | 492.0 | 0.0 | 66.0 65.4 | 0.0 0.0 | 3.1 | 120 | PL 125.00 FTG T TL 155.00 | | 0.0 |
| 27A . | e: 29 492.0 497.0 | 0.0 0.0 | 65.4 63.3 | 0.0 | 0.0 | 120 | PL 6.00 FTG TL 6.00 | PF PE FV | 0.0 . 2.2 0.0 |
| Pip 27A 28 | e: 30 492.0 491.0 | 0.0 | 65.4 65.5 | 0.0 | 3.1 | 120 | PL 125.00 FTG TL 125.00 | FF FE FV | 0.4 0.4 0.0 |
| Pip 28 29 | 491.0 | $Q \cdot Q$ | | 0.0 | 3.1 | 120 | PL 250.00 FTG TL 250.00 | PF PE PV | 0.8 0.4 0.0 |
| Pip 29 30 | 490.0 | 31.0 | | | 0.3 | 120 | PL 250.00 FTG TL 250.00 | | 0.0 0.0 0.0 |
| | 490.0 | 31.0 | | 250.0 | 2.4 | 120 | PL 4.00 FT8 E TC 118.00 | EΞ | 0.0 2.2 0.0 |
| Pip 31 32 | 495.0 | 0.0 | 62.9 61.7 | 0.0 | 2.4 | 120 | PL 4.00 FTG T TL 34.00 | FE | 1.3 |
| | e: 35 498.0 498.0 | 0.0 0.0 | 61.7 61.7 | o.o | 1.0 | 1.20 | PL 4.00 F16 T TL 34.00 | PE FE FV | 0.0 |
| 33 | | | | | 0.0 | 120 | FTG E | PE PV | 0.9 |
| | e: 37 498.0 498.0 | 0.0 0.0 | 61.7 61.7 | 0.0 0.0 | 1.0 | 120 | FL 8.00 FTG TL 8.00 | 86 80 87 | 0.0 |
| | | | 62.6 | 0.0 0.0 | 0.0 | 120 | | PE PE PV | 0.0 0.9 0.0 |



| Ε | TAG ND DES | ELEV. | | | | VEL (FPS |) HW(C) | LENGTH (FT) | Si | JM. |
|-----|--------------------|---------------|-----------------|--------------|------|----------------|-----------------|----------------|-----|-------------------|
| | Pipe | : 39 | | | | -3.6 | 6.065 P | L 250.00 | PF | 0.0 |
| 35 | , | 494.0 | 0.0 | 63.4 | 0.0 | 0.0 | 120 F | TG | FE | 0.4 |
| 36 | | 495.0 | 0.0 | 63. 0 | 0.0 | | 0.000 T | L 250.00 | PV | 0.0 |
| | Fipe | : 40 | | | • | | | L 125.00 | PF | 0.0 |
| 36 | | 495.0 | $\circ . \circ$ | a3.0 | 0.0 | 0.0 | 120 F | TG T | ĿΕ | 0.9 |
| 37 | | 497.0 | 0.0 | 62.1 | 0.0 | | 0.000 T | L 155.00 | FΥ | ၁.၁ |
| | Fipe | : 41 | | | | 0.0 | 4.026 P | L 6.00 | ₽F | 0.0 |
| 37 | • | 497.0 | 0.0 | 62.i | 0.0 | \circ, \circ | 120 F | TG | ΡE | 2.2 |
| 38 | | 502.0 | 0.0 | 60.0 | 0.0 | | 0.000 T | L 6.00 | PV | 0.0 |
| | Pipe | : 42 | | | | -3.6 | 6.065 F | L 125.00 | PF | 0.0 |
| 37 | | 497.O | 0.0 | 62.1 | 0.0 | 0.0 | 120 F | TG | ΡE | 0.4 |
| 39 | | 498.0 | 0.0 | 61.7 | 0.0 | | 0.000 T | L 125.00 | PΥ | 0.0 |
| | Pipe | : 43 | | | | | 6.0 65 F | | PF | 0.0 |
| 37 | | 498.0 | 0.0 | 61.7 | 0.0 | 0.0 | 120 F | TG | PE | 0.9 |
| 40 | | 500.0 | 0.0 | 60.9 | 0.0 | | 0.000 T | L 250.00 | PΥ | 0.0 |
| | | : 44 | | | | | | L 250.00 | ΡF | 0.0 |
| 40 | | 500.0 | 0.0 | 60.8 | 0.0 | 0.0 | 120 F | TG | PE | 0.9 |
| 41 | | 5 02.0 | 0.0 | 60.0 | 0.0 | | 0.000 T | L 250.00 | FΥ | 0.0 |
| | Piρe | : 45 | | | | | | L 250.00 | FF | 0.0 |
| 41 | | 502.0 | \circ \circ | 60.0 | 0.0 | 0.0 | 120 F | TG 25 | FE | \circ . \circ |
| 42 | | 502.0 | 0.0 | £0,0 | 0.0 | | 0.000 T | L 278.00 | F"/ | Q.O |
| | Pipe | : 46 | | | | | | L 250.00. | | 0.0 |
| 40 | | 502.0 | 0.0 | 60.0 | 0.0 | 0.0 | 120 F | TG | FE | 0.9 |
| 4.3 | | 500.0 | 0.0 | 50.8 | 5.0 | | 0.000 T | L 250.00 | PV | 0.0 |
| | | : 47 | | | | -3.6 | გ.055 წ | L 250.00 | 두두 | |
| 43 | | 500.0 | 0.0 | 60.8 | ů.O | 0.0 | 120 F | TG | PΕ | 0.9 |
| 44 | | 498.0 | 0.0 | 61.7 | 0.0 | | 0.000 T | L 250.00 | ₽V | 0.0 |
| | Pipe | | | | | -3.6 | | L 125.00 | | |
| 4.1 | | | | | | | | TG T | PŒ | C. A |
| 45 | | 497.0 | 0.0 | 52.1 | 0.0 | | 0.000 T | L 155.00 | FV | Ů,Ū |
| | Pipa | : 47 | | | | 0.0 | 4.026 F | L 6.00 | PF | 0.0 |
| 45 | - | | 0.0 | 62.1 | 0.0 | 0.0 | 120 F | T/3 | FΕ | 2.2 |
| 46 | , | | | | 0.0 | | | L 6.00 | PV | 0.0 |
| | Pipe | : 50 | | | | -3.6 | 6.065 P | L 125.00 | FF | ō . 0 |
| 45 | - ₄ . – | | 0.0 | 63.1 | 0.0 | | 120 F | TG | EE | 0.4 |
| 47 | | 496.0 | 0.0 | 62.6 | 0.0 | | 0.000 T | L 125.00 | PV | 0.0 |
| | Pipa | : 51 | | | | -3.5 | 6.065 P | L 250.00 | FF | 0.0 |
| 47 | • | | 0 0 | 62.6 | 0.0 | 0.0 | 120 F | | FΈ | 1.3 |
| 48 | | 493.0 | 0.0 | 63.9 | Ο, Ο | | 0.000 T | L 250.00 | PΥ | ϕ ϕ |



JOB TITLE: H3275.01 B331 STANDFIFE PIPE DATA (cont'd)

| PIPE TA END NODES | ELEY. | | | | VEL (FPS |) HW(C | N) LENGTH) (FT) T | | |
|-------------------------|--------------------------|------------|---------------|------------|---------------|-----------------------|----------------------------------|----------------|---------------------|
| 48 | pe: 52 493.0 491.0 | 0.0 | 63.9 64.7 | 0.0 0.0 | 0.0 | 120 | PL 125.00 FTG TL 125.00 | PΞ | 0.0 0.9 0.0 |
| 4 <i>9</i> 50 | pe: 53 491.0 498.0 | 0.0 | 51.7 | 0.0 | 0.0 | 120 0.000 | PL 125.00 FTG ET TL 159.00 | PF FE FV | 0.0 3.0 0.0 |
| Fi 50 51 | pe: 54 498.0 498.0 | 0.0 | 61.7 | 0.0 0.0 | -89.6 1.0 | 6.065 120 0.000 | FL 4.00 FTG T TL 34.00 | FF FZ FV | 0.0 0.0 0.0 |
| 32 | pe: 55 493.0 498.0 | 0.0 0.0 | | 0.0 | 1.4 | 120 | PL 4.00 FTG T TL 34.00 | PE | 0.0 0.0 0.0 |
| 52 | pe: 56 498.0 496.0 | 0.0 | 51.7 | 0.0 | -129.8 1.4 | 120 | FL 4.00 FTG TL 4.00 | PΕ | 0.0 0.0 0.0 |
| 51 | pe: 57 498.0 495.0 | 0.0 | | 0.0 | 2.4 | 120 | PL 4.00 FTG TL 4.00 | PΕ | 0.0 1.3 0.0 |
| 53 54 | 490.0 | 0.0 | გ5.5 | 0.0 | 2.4 | 120 | FL 125.00 FTG E TL 139.00 | | 0.3 2.2 0.0 |
| ⊅ 4 | pe: 59 490.0 491.0 | 1, | ಏಪ∙ಎ | 0.0 | 2.4 | 120 | FL 250.00 FTO TL 250.00 | PΞ | 0.5 0.4 0.0 |
| Pi 53 54 | | 0.0 | 45.6 60.1 | 0.0 | 2.4 | 120 | PL 250.00 FTS TL 250.00 | FΈ | |
| 7i 56 57 | pe: 61 491.0 492.0 | 0.0 | ბბ.1 გბ.0 | (0.3) | 2.4 | 120 | PL 125.00 FTG T TL 155.00 | FE | 0.3 0.4 0.0 |
| | pe: 62 492.0 497.0 | | | | 0.0 | 120 | PL 5.00 FTG TL 6.00 | PF PE PV | 0.0 2.2 0.0 |
| Fi 57 59 | pe: 63 492.0 492.0 | 0.0 0.0 | 66.0 [66.3 | 0.0 | 2.4 | 120 | PL 125.00 FTG TL 125.00 | PF PE PV | 0.3 0.0 0.0 |
| Fi 59 60 | pe: 64 492.0 493.0 | 0.0 0.0 | | 0.0 | 2.4 | 120 | PL 250.00 FT6 TL 250.00 | PF PE PV | 0.5 . 0.4 0.0 |

JOB TITLE: H3275.01 B331 STANDFIFE PIPE DATA (cont'd)

| E | E TAG END ELEV. DDES (FT) | | | | VEL (FRS | | | | . MLI |
|----------|---------------------------------|------------|--------------|-------------|----------|-------|----------------------------------|----------------|-------------------|
| 60 61 | Pipe: 65 493.0 494.0 | 0.0 | | 0.0 | 2.4 | 120 | PL 250.00 FTG TL 250.00 | PF FE PV | 0.5 0.4 0.0 |
| 61 62 | fipe: 66 494.0 502.0 | | | 0. 0 | 2.4 | 120 | | PE PE FV | 0.4 3.5 0.0 |
| 62 63 | Pipe: 67 500.0 502.0 | 0.0 | | 0.0 | 2.8 | 120 | FL 4.00 FTG T TL 34.00 | PF PE PY | 0.0 0.0 0.0 |
| 63 64 | Fipe: 68 502.0 497.0 | | | 0.0 | 2.8 | 120 | FL 4.00 FTG TL 4.00 | PF PE PV | 0.0 1.3 0.0 |
| 64 65 | Fipe: 59 499.0 495.0 | 0.0 | 64.8 66.9 | 0.0 | 2.8 | 120 (| PL 125.00 FTG E TL 139.00 | PF PE PV | 0.4 1.7 0.0 |
| 65 65 | Pipe: 70 495.0 495.0 | 0.0 | 66.9 67.6 | 0.0 | 2.8 | 126 | PL 250.00 FTG TL 250.00 | FF PE PV | 0.7 0.0 0.0 |
| 66 | Sipe: 71 495.0 496.0 | 0.0 | | 0.0 | 2.8 | 120 1 | FL 250.00 FT3 TL 250.00 | PE PV | 0.7 0.4 0.0 |
| | Pipe: 72 495.0 496.0 | 0.0 | 67.9 68.3 | Ū.C | 2.8 | 1.20 | PL 120.00 FTS T Th 150.00 | PF FE FV | 0.4 0.0 0.0 |
| | Pipe: 73 496.0 501.0 | O Q | 68.3 66.1 | 0.0 0.0 | 0.0 | 120 8 | FL 6.00 FT3 TL 6.00 | PΕ | 0.0 2.2 0.0 |
| 68 70 | Pipe: 74 496.0 497.0 | | | 0.0 | 2.8 | 120 (| PL 125.00 FTG TL 125.00 | 96 96 87 | 0.4 0.4 0.0 |
| 70 71 | Pipe: 75 477.0 497.0 | 0.0 | 68.2 68.9 | 0.0 | 2.8 | 120 F | PL 250.00 PYG TL 250.00 | FF FV | 0.7 0.0 0.0 |
| 71 72 | Pipe: 76 497.0 498.0 | 0.0 0.0 | 65.9 69.2 | 0.0 | 2.3 | 120 f | TL 250.00 TL 250.00 | | 0.7 0.4 0.0 |
| 72 73 | Pipe: 77 498.0 506.0 | 0.0 | 69.2 66.2 | 0.0 | 2.8 | 120 F | PL 125.00 FTG ET TL 169.00 | PF PE PV | 0.5 3.5 0.0 |

FΕ

FV

4.00

1.3

O.O

JOB TITLE: H3275.01 B331 STANDPIPE PIPE DATA (cont'd)

| PIPS TAG Q(GPM) DIA(IN) LENGTH : PRESS. | | | | | | | | | | | |
|---|------|------------------------|-----|--------------|------------|------------------------|-----------------------|---------------------------------|----------------|-------------------|--|
| Ε | ND | | (K) | | | VEL (FPS. | HW(C |) (FT) T | SI (PS | JM. | |
| 70 74 | Fipe | : 73 506.0 506.0 | 0.0 | 66.2 66.3 | 0,0 0.0 | -254.8 I.E | 6.065 120 6.003 | FL 4.00 FTG T TL 34.00 | FF FE FV | 0.0 0.0 0.0 | |
| 74 75 | , | : 79 506.0 503.0 | 0.0 | 66.3 | 0.0 | 2.8 | 120 | FL 4.00 FTG TL 4.00 | FF FE FV | 0.0 1.3 0.0 | |
| 75 | • | : 80 503.0 499.0 | 0.0 | | 6. O | 2.8 | 120 | PL 125.00 FTG E TL 139.00 | FF FE FV | 0.4 1.7 0.0 | |
| 76 77 | Fipe | : 81 499.0 500.0 | 0.0 | 69.7 69.9 | 0,0 0,0 | -2 5 0.0 2.8 | 6.065 120 0.003 | FL 250.00 FTG TL 250.00 | FF FE FV | 0.7 0.4 0.0 | |
| 77 79 | Fipe | : 82 500.0 500.0 | 0.0 | 49.9 70.6 | 0.0 0.0 | -250.0 2.8 | 4.045 120 0.003 | FL 250.00 FTG TL 250.00 | PF PE FV | 0.7 0.0 0.0 | |
| 79 7 | Fipe | : 83 500.0 509.0 | 0.0 | 70.6 67.0 | 0.0 0.0 | -250.0 2.8 | 6.065 120 0.003 | PL 70.00 FTG ET TL 114.00 | FF FE FV | 0.3 3.9 0.0 | |
| 7 3 | • | : 84 509.0 509.0 | 0.0 | | O.O | 2.8 | 120 | PL 4.00 FTG T TL 34.00 | FE | 0.0 0.0 0.0 | |
| 9 | • | | | | 0.0 | 2.8 | 120 | PL 4.00 FTS T TL 34.00 | FΕ | 0.0 0.0 0.0 | |
| . | Fipe | | | | | Ų, Ģ | | FL 4.00 | | 0.0 | |

NETES:

8

9

509.0

505.0

(1) Calculations were performed by the HASS 5.2.1 computer program under license no. 3146 75A granted by HRS Systems, Inc. 2193 Ranchwood Dr., N.E. Atlanta, GA 30345

 (\cdot, \cdot)

0.0 0.0 120 FTG

0.000 TL

(2) The system has been balanced to provide an average imbalance at each node of 0.007 gpm and a maximum imbalance at any node of 0.201 gpm.

0.0 57.1

68.4

0.0

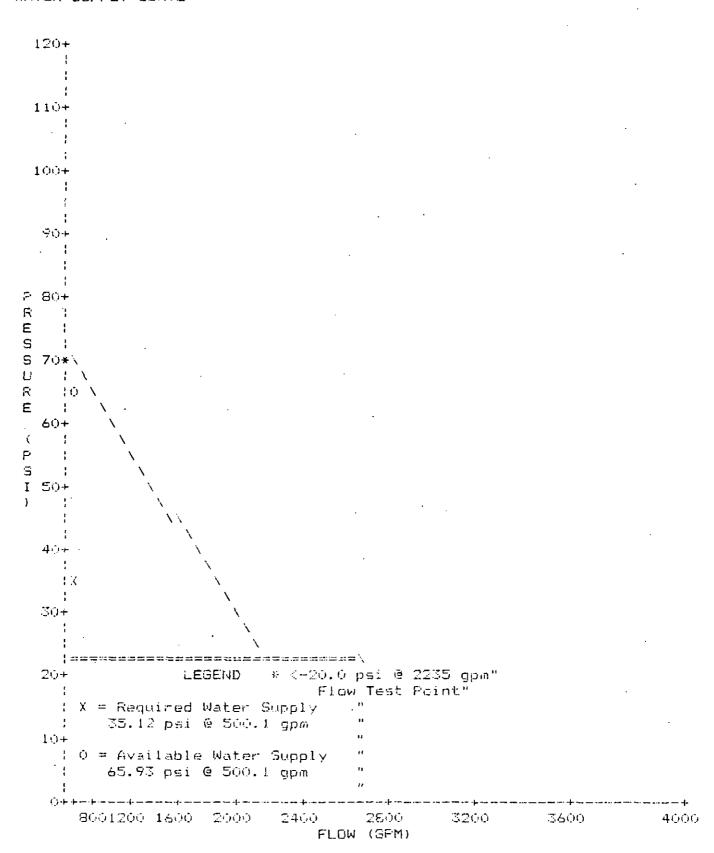
(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity in any pipe is 5.6 ft/sec.

JOB TITLE: H3275.01 B331 STANDPIPE PIPE FITTINGS TABLE

| Nominal | Equivalent Fitting Lengths in Feet (C=120) | | | | | | | | | | |
|------------------|--|-------|-------|---------------|--------------|------|-------|-------|--|--|--|
| Diameter (in) | Ε | ٣ | L. | C | В | G | Α | D | | | |
| 1.00 | 2.00 | 5.00 | 2.00 | 5.00 | 5. 00 | 1.00 | 10.00 | 10.00 | | | |
| 1.25 | 3.00 | 6.00 | 2.00 | 7.00 | 6.00 | 1.00 | 10.00 | 10.00 | | | |
| 1.50 | 4.00 | 8.00 | 2.00 | 9.00 | 6.00 | 1.00 | 10.00 | 10.00 | | | |
| 2.00 | 5.00 | 10.00 | 3.00 | 11.00 | 6.00 | 1.00 | 10.00 | 10.00 | | | |
| 2.50 | 5.00 | 12.00 | 4.00 | 14.00 | 7.00 | 1.00 | 10.00 | 10.00 | | | |
| 3.00 | 7.00 | 15.00 | 5.00 | 16.00 | 10.00 | 1.00 | 13.00 | 10.00 | | | |
| 3.50 | 8.00 | 17.00 | 5.00 | 19.00 | 11.00 | 1.00 | 14.00 | 10.00 | | | |
| 4.00 | 10.00 | 20.00 | 6.00 | 22.001 | 12.00 | 2.00 | 20.00 | 10.00 | | | |
| 5.00 | 12.00 | 25.00 | 8.00 | 27.00 | 9.00 | 2.00 | 21.00 | 15.00 | | | |
| 5.00 | 14.00 | 30.00 | 9.00 | 32.00 | 10.00 | 3.00 | 28.00 | 19.00 | | | |
| 3.00 | 18.00 | 35.00 | 13.00 | 45.00 | 12,00 | 4.00 | 35.00 | 27.00 | | | |
| 10.00 | 22.00 | 50.00 | 16.00 | 55.00 | 19.00 | 5.00 | 40.00 | 29.00 | | | |
| 12.00 | 27.00 | 60.00 | 18.00 | 45.00 | 21.00 | 6.00 | 47.00 | 35.00 | | | |
| 16.00 | 35.00 | 70.00 | 23.00 | 86.00 | 22.00 | 7.00 | 63.00 | 45.00 | | | |
| 18.00 | 39.00 | 85.00 | 33.00 | 93. 00 | 39.00 | 8.00 | 70.00 | 50.00 | | | |

Fitting Code Letters: E=standard ell T=tee L=long turn ell C=check valve B=butterfly valve G=gate valva A=alarm check valve D=dry pipe valve

JOB TITLE: H3275.01 B331 STANDPIFE WATER SUPPLY CURVE



FIRE SERVICE "PRESSURE-FLOW" REPORT

| of | | | | | | | | | | | | • | | | | |
|---------------------|------------------------|-------------------------------|--------------------|------------------|-------|--------------------|-------|---------------|---------|----------|--------|--------------------|--------------------|---------------------------|-----------------------------|----------------------------|
| The sy | /stem ma | ximun | pres | sure i | is | 0 | psi b | ased o | n a str | eet ele | vation | of_ | <u> 58</u> | Z leet at | the service lo | cation, Thi |
| System | n maxim | um pr | essur | e shoi | d blu | e use | ed in | determ | ining t | he cla | ss of | pipin | g and fi | ittings only | / . | |
| The fide location | ow quant on, Future | ities a e co nd | nd pr itions | essure in the | e sys | tam, | hower | er, ma | y Caus | e the | llow q | rmin uanti | ed to b ties an | e available d pressure | at the requests to change a | sted servicescordingly |
| | | | _ | | | MULT | IPLY | SCAL | E BY | | 00 | | | | | |
| | 1 | 50⊯ | 1 = 1 | • | | , | | 9 □ | | | 12 | 1. } | | H ! | 5 | |
| | | | | | | | | | | | | | | | DOMESTIC METER | FLOW* (GPM) |
| | 3 | 40 | | | ₽ | | | | | | | | | | Į. | 56 |
| | 13.0 | 30 E | | | | | | | | | | | | | 1V2° | 96 |
| F | • | | | | | | | | | | | 围 | | | 2 | 160 |
| PHESSURE I – PSI | 1 | 20 | 4 | | | | | | | | | 茸 | | | 3° . | 220 |
| PSI | | F | | | | | | | | | | | | | 6. | 700± |
| ¥ 1 | ı | 10 | | | | | | | | | = | | | | 8- | 1500 |
| ⋥ | Z II. | | ## | | | | | | | | | | | | 10" | 2500 |
| | ŀ | 00暦 | | #= | | | | | | | | | | | 5105 | 51.511 |
| <u> </u> | | | | | | | | | | | | | ≒ | | FIRE | FLOW* (GPM) |
| RESID STREET | , | 90 E | 彗 | | | | | | | | | | | | 2° | |
| | | _ | | | 譁 | | | | | | | | | | 1 4° 1 | 25 0 60 0 |
| <u>,</u> ≚ | | BO | | | | | | | | | | | | | 6 | 1400 |
| . = | | ₽ | 20.0 | | | | | | | | | | 主 | | 8 | 2500 |
| | | 70 | | ~M | 69 | 5/ | | | | | | | | | 10° | 5000 |
| | | 60 | N | | | | | | | | | | === | | F. M. | FLOW* |
| | · | | | | | | | | | | | | | | SERVICE | (GPM) |
| | | 50 E | | | X | | | | | | | | | | 8" | 2500 |
| | | Ĭ | | | | Ŋ | | | | EE | | r = | | | 10" | 5000 |
| | | 40 | | | | | | | | | | | | | L | |
| | | | | | | | | | | | | | | | USED WHEN C | M M74 è£ |
| | | 30 E | | | | | | | | | === | | | | STANOPIPE IS | |
| | | | | | | | | | | 22. | 35 G | PM | @20 | PSI | . MAXIMU | M PERMISSI |
| | ; | 20 🗺 | ::-:::: | <u> </u> | | | | | | 7 | === | <u> </u> | = + - | + - | BLE FLOW FOR | SIZE SHOW |

This graph will be submitted to the Department of Building and Safety for plan check purposes. For additional information call

| _ | ". Veller | 481-3273 | Distribution 5 | OPERATING DIVISION Ingineering - Rm. 1432 | CERBON HORST | .C.R.T.D. LIBRARY |
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| | , Valley | 481-4089 481-6205 | MIRA SIMON | M. J. ALDRIAN | APR 14 1989 | Coord. 166-174 |
| | Western | 481-3272 🗀 | | APR 1 & 1989 | | P.M |
| | Centrel | 481-6086 | Prepared by | Checked by | Approved by | Form Rev. — 2 / 86 |